The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

AUGUST, 1925

Cost Accounting for the Heating Contractor

Simplified Methods Designed Particularly to Furnish Cost Data for Use in Estimating New Work

By Arthur J. Peel

Consulting Accountant, Boston, Mass.

WIDE variations between competing estimates for the same job, that are constantly being noted by architects and owners of buildings, has brought to light two important needs in the building industry, one, for a more uniform method of estimating, for each trade; and the other, the need of uniform cost accounting practice in each of the various trades associated or allied with the building industry.

The first of these is manifestly a matter for trade associations and organizations to take up in conjunction with State and federal bodies; the second is also a matter upon which trade associations will have to pass, but, in the meantime, it is a need so imperative, that master-tradesmen, contracting firms, engineering firms, and manufacturers, large and small, have individually made considerable progress towards better accounting methods.

On the other hand, we have hundreds and thousands of small concerns that are still seriously handicapped by a lack of proper accounting methods, inadequate records, and faulty and unreliable cost data. It is these individuals and firms that unwittingly injure the whole field in which they operate, because their methods are more "guesstimating," than estimating.

Without a proper and continuous record of unit costs, there can be no such thing as accurate and scientific estimating.

But another difficulty that confronts the specialized trade contractor, is the lack of well-prepared and planned accounting systems applicable to his particular industry.

In the heating and ventilating industry, it seems that among the larger firms, proper accounting methods have been installed, and these men are getting accurate cost data; but among the smaller firms conditions are about as bad as among other industries.

While there are certain fundamental principles that apply to all and any industry that has to do with building construction, the belief that what will take care of the plumber, the painter, the concrete contractor, will likewise meet the need of the heating and ventilating contractor, is entirely erroneous. Each trade needs its own particular and distinctive method of cost-finding. The only common basis for all building and construction trades, is that all should conform to the classified trade operations shown on the form of estimate. When we get a standardized form of estimate, as seems likely now, the problem as to how the building trades should classify their cost factors will be greatly facilitated.

SIMPLICITY NEEDED IN ACCOUNTING AND BOOKKEEPING

During recent years there has developed a marked tendency to reduce the number of separate accounting records, or books of account; and while this has not gone very far in the building construction industry, it has been developed quite successfully in other lines of productive work. The great cry throughout the construction field is *simplicity* in accounting and bookkeeping.

In a single article it will be impossible to cover the whole field of accounting in the heating and ventilating industry, but we will take up the most important basic accounting record, from which the bulk of accounting information is taken for the general ledger, and for the cost sheets.

FIVE BASIC FACTORS

There are five basic factors in all accounting. They are as follows:

(1) Purchases of material, supplies, services, labor, and other expenses.
(2) Cash disbursements, or payments.
(3) Cash receipts, or income.
(4) The sale of contract work, jobbing work, and merchandise.
(5) The transfer of values from one account to another; or, the transfer of business assets to operating expense accounts.

The usual and common method of setting up records which reflect these factors, is by opening up the following books of account:

(a) An invoice register.
(b) A cash book.
(c) A journal.
(d) A contract, jobbing, and merchandise sales book.

From these books of original entries, postings are made to ledger accounts. The general ledger is nothing more or less than an accumulated and classified record of every transaction appearing in the four books of original entry, mentioned above.

IMPORTANCE OF RELATING GENERAL ACCOUNTS AND COST ACCOUNTS

A common fault in accounting systems operated by trades and engineering concerns associated with or allied to the building construction industry is that there is little or no connection between the general accounts and the cost accounts. In fact, from personal experience with many firms and individuals in the building and allied industries, the writer has found that usually no attempt is made to harmonize the cost figures with the general accounts.

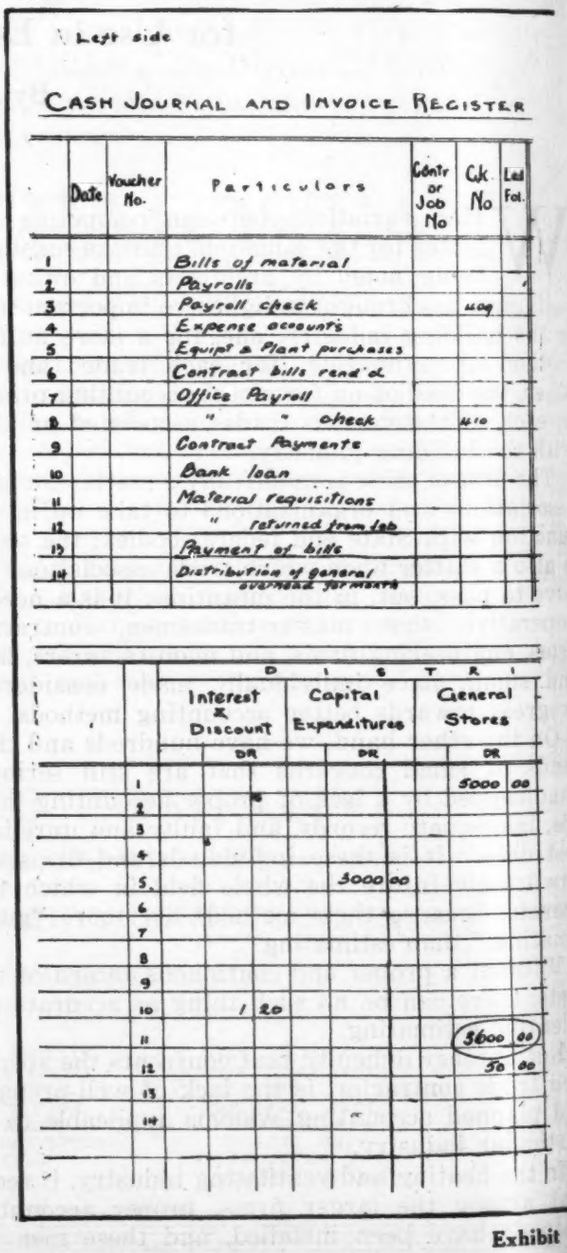
Two weaknesses are developed by this failure to relate the two branches of accounting; one is, that bills, and other original papers have to be handled several times, and much duplication is necessary; and the other, that there is a serious lack of controlling records against which to check the cost figures worked from independent reports received, usually, from foremen on the job, or in the factory.

The system which is presented here is a cost accounting system from the word "GO," and while developing all necessary information for the general ledger accounts, it is at the same time breaking up the expenditure in such a way as to establish a set of controlling accounts which will serve as guides and checks when preparing cost sheets and unit costs.

FORM SHOWN A COMBINATION OF CASH BOOK, INVOICE REGISTER AND JOURNAL

The form devised and prepared by the writer specially for use by heating and ventilating engineers, is shown as Exhibit "A." This form is a combination of three of the bookkeeping records mentioned above; the Cash book, the Invoice Register, and the Journal. The reader will doubtless notice that this form conforms to what is known as the double-entry system of bookkeeping; that is to say, for every individual charge there is a corresponding credit, and vice versa. This is not a complicated or difficult principle to understand, though many people think it is. By using the form illustrated, it comes almost automatically, and anyone studying the specimen entries even though he may know nothing about double-entry bookkeeping, will get a fair idea as to how it works, and why.

Let us examine this form critically. In the first place note that it is made up of two individual sheets. These sheets are bound in a loose-leaf binder, one opposite the other. By this means we make up from the two sheets one *complete* form, by placing one beside the other. For the purpose of reproduction it was necessary to show one under the other, but the reader must understand that in actual operation, line 1 extends right across the two pages, and that an entry on the left side of the form



Left side

CASH JOURNAL AND INVOICE REGISTER

	Date	Voucher No.	Particulars	Contr or Job No	Chk No	Led Fol.
1			Bills of material			
2			Payrolls			
3			Payroll check		109	
4			Expense account's			
5			Equipt & Plant purchases			
6			Contract bills rend'd.			
7			Office Payroll			
8			" " check		110	
9			Contract Payments			
10			Bank loan			
11			Material requisitions			
12			" returned from Job			
13			Payment of bills			
14			Distribution of general overhead for month			

	DISTRI											
	Interest & Discount			Capital Expenditures			General Stores					
	DR			DR			DR					
1							5000	00				
2			16									
3												
4		5										
5					3000	00						
6												
7												
8												
9												
10		1	20									
11							3600	00				
12							50	00				
13												
14												

Exhibit A

which is extended out into a column on the right side of the form, is on the same line. The use of line numbers is advisable for the purpose of reducing the danger of distributing items on the wrong line when carrying them across the page.

As a record of cash transactions, this form fully meets every requirement, and the specimen entries on lines number 3, 8, 9, 10, and 13 will clearly indicate how these transactions are handled. However, instead of using specific items for the purpose of illustration, we have used entries that illustrate the *character* of the items which would appear in actual operation. This was necessary owing to the limited space available for entries. Practically every class of entry that occurs in actual practice is shown, however.

The reader will note that all payments (cash credits) are charges to Accounts Payable, including the payroll check. This is because all expenditure has been accrued and charged up at the time it was *incurred.* This is a very important principle and is essential to cost accounting. The cost of work, is the liabiity *incurred* for that work, not the *payments* made on account.

Personally we believe in including payrolls under this rule, and entering the payroll as a liability as soon as it is made up. If this is done the payroll check is a charge to Accounts Payable, just like any other accrued expenditure covered by a payment. But there are many people who do not like to accrue payrolls, and in these circumstances, a payroll is not entered until the payroll check is issued, when it is shown, first as a *credit* to CASH in the usual way, then as a *charge* to LABOR, instead of Accounts (including payrolls) Payable.

It will be noted that there are no bank columns. This is quite intentional. On general principles *all* payments should be made by *checks,* and *all* receipts be *deposited.* This is the only safe course to adopt in bookkeeping, and will save a pile of

EXHIBIT "A"

MONTH OF July 1925

CASH ACCOUNT				ACCOUNTS PAYABLE				ACCOUNTS RECEIVABLE				INCOME ACCOUNTS							
Receipts		Checks		DEBITS		CREDITS		DEBITS		CREDITS		CONTRACTS		JOBBING		M'DSE.		SUNDRIES	
DR		CR										CR		CR		CR		CR	
						5000	00												
						2000	00												
		2000	00	2000	00														
						1500	00												
						3000	00												
								10000	00			10000	00						
						800	00												
		800	00	800	00														
2000	00									2000	00								
998	80																	1000	00
		900	00	900	00														

Right side

DISTRIBUTION OF GENERAL EXPENSE								DISTRIBUTION OF EXPENSE											
Salaries		Supplies		Other Expense		Selling Expense		Operating Accounts - Heating						Operating Accounts - Ventilating					
								LABOR		MATERIAL		EXPENSE		LABOR		MATERIAL		EXPENSE	
DR		DR		DR		DR		DR		DR		DR		DR		DR		DR	
								1700	00					500	00				
		900	00	300	00							200	00					100	00
500	00					300	00												
										2400	00					1200	00		
																50	00		
		* 2000	00							* 1250	00					* 720	00		

A. J. Rad. Boston, Mass.

Combination Cash Book, Invoice Register and Journal

trouble later on, besides reducing the cost of auditing, if auditors are employed. If all payments are made by checks and all money received is deposited in the bank, it stands to reason that the Cash Account will be the Bank Account, also. Reconciliation with the bank statement balance can be made at the end of the month by taking into account the balance at the beginning of the month, and deducting the outstanding checks.

"But," says someone, "what about petty cash payments? I must make some payments in cash!" Certainly, and for this reason we must have a petty cash *fund*. The check drawn to start the fund, and the weekly checks drawn to maintain it, are entered in the Cash-Journal, like any other check, but the payments *from* the fund are *not* entered in the Cash-Journal but in the petty cash-book. The total of these payments for one week, is entered in the Cash-Journal as a *payment* to the fund. In this way we accomplish two things: first, we make a record of petty cash expenditures which will be incorporated in the ledger and cost accounts in the usual way, and, secondly, we reimburse the petty cash fund with what has been expended, and thus bring it back to its original amount.

PURCHASE ENTRIES

Now let us look at the entries which under older systems appear in the Invoice Register. These are, of course, the purchases, and are shown on lines 1, 4 and 5. These entries are made only after the bills have been checked as to receipt of material, supplies, equipment, price, extensions and totals. Since they all represent liability to creditors, the Accounts Payable account is credited. Then because they also represent *expense* incurred, the accounts chargeable are debited. When this is done we don't have to worry any more about charging the proper accounts; that is all taken care of, and if the account is not paid for six months after the completion of work, we can rest assured that the cost of that work includes the *unpaid* account, as well as the paid accounts.

Material purchased for a particular contract or job may likewise be so designated at the time the entry is made, and the number of the contract to be charged may be entered in the column provided for that purpose. This makes it unnecessary to refer again to individual bills when charging up customers, for it must be borne in mind that the Cash-Journal and Invoice Register need be the *only* posting record to the general ledger, the customer's account, and the cost sheets.

DISTRIBUTION OF EXPENDITURES

The distribution of expenditures is one of the most important features in any cost system, for it is from the expenditures that we get costs. A study of the various classifications shown on the right side of the sheet will illustrate the manner by which accounts are classified and segregated. This distribution, as has already been explained, is made at the time the bills are entered. One of the most neglected accounts in many businesses is that which reflects the overhead expense. There are reasons for this, of course, but whatever they are, this particular type of record eliminates them, for the distribution of overhead expense to three (or four, if selling expense is included as overhead) columns, automatically provides a total which is to be distributed over the operating accounts at the end of each month.

THE STORES ACCOUNT

All material and supplies, including small tools, should be taken into stores, if not delivered direct to the contract. The general stores constitutes an asset of the business, of course, since it is capital expenditure. During the month requisitions are made on the stores from time to time, by the foremen, and these are totalled and entered as one total at the end of the month; as a *credit* to the Stores Account and *charges* to the operating accounts concerned. The effect of this is to show, in the Stores Account in the ledger, a perpetual book inventory of material and supplies.

SUBDIVIDING THE EXPENSE

We now come to an important feature in cost-accounting on which we cannot dogmatize, but which we submit for careful consideration. In all the expense columns the reader will notice an additional narrow column preceding the amount column; this is for the purpose of indicating by means of a code number, a sub-division of the expense shown at the head of the column. These sub-divisions, in the case of general expense, for example, would be, under salaries: executive salaries, clerical, store-keeper. Supplies might be divided up into stationery and printing, office supplies; expense, into postage and telegrams, telephone, repairs and renewals, etc. Then selling expense should be sub-divided into advertising, salesmen's salaries or drawing accounts, traveling, etc.

Now, coming to the operating accounts, we meet some problems. No difficulty should be experienced, for example, in showing on the payroll, a sub-division of labor expense under these three headings: Steam and Water Heating, Warm Air Furnace Heating, and Ventilating. But can we go further than this? Remember that we need to go as far as we can towards a *unit* cost of work, and that unit will be a unit of labor, a unit of material, and then a percentage of overhead to add to both, and this will give us an all-inclusive unit cost of installing radiators, for instance, on the basis of square feet.

It will be impossible to develop this aspect of the subject in the present article, however. But we do need to know just how far towards this end, we can go in our distribution on the Cash-Journal and Invoice Register.

In order that we may have some idea of how fine an analysis is required in order to arrive at intelligent unit costs that tell a story, let us set up a chart of sub-classifications of labor, and material, which will cover the operations of a fair-size business:

STEAM AND HOT WATER HEATING
(Account 100)

LABOR

101. Hauling heating materials to job and unloading.
103. Handling and setting boiler.
105. Bricking up boiler, breeching, etc.
107. Running mains, risers, and roughing in for radiators.
109. Setting and connecting radiators, valves, air cocks, etc., ready to operate.
111. Setting temporary radiators, connecting and disconnecting same to furnish temporary heat during construction.
113. Painting and bronzing rads.
115. Covering steam and hot water pipes.

MATERIAL

102. Pipe and fittings.
104. Boilers, tanks, etc.
106. Radiators.
108. Thermostat.
110. Pipe covering.
112. Bronze and paint.
114. Sheet iron and steel.

WARM-AIR FURNACE HEATING
(Account 200)

201. Installing heat ducts, register faces, etc.
202. Heating ducts.
203. Installing warm-air furnace.
204. Installing pipeless furnace.
205. Register faces.
206. Warm-air furnaces.

VENTILATING
(Account 300)

Classified along the same lines as shown above.

For the purpose of establishing controlling accounts against which may be checked the labor tickets, or reports turned in by the foremen on the jobs, a distribution of the payroll under the three main classifications shown as accounts 100, 200 and 300, is all that is necessary. Material can, of course, be distributed and charged to the sub-classification numbers shown on the foregoing chart.

SEPARATE PAYROLLS FOR EACH LARGE CONTRACT

It is advisable to prepare separate payrolls for each large contract; and for smaller contracts, the labor charges against each may be *summarized* on one payroll. In the Accounts Payable column, it is necessary to show only the total of the whole payroll, but in the operating columns, under Labor, this total should be split up according to contract numbers.

Where it is necessary to show *credits* in debit columns, as in item 12 for example, these should be in *red* ink, as credits must be totalled separately and posted *as* credits to the ledger account.

The Sales Book, or carbon copies of bills rendered to customers, provides the entry on line 6. This item is the total of *all* the bills rendered for the month, and should be the last entry on the register, *before* totalling the columns. Jobbing and merchandising sales are treated the same way as contracting sales. All charges to customers that can be accrued and billed, are *credits* to some income account, and *charges* to Accounts Receivable.

INFORMATION FURNISHED BY THE FORM

Now to sum up; what have we got on this form? Assuming that all entries are made for the month, we total all the columns, and these totals are transferred to corresponding ledger accounts. It is practically impossible to make a mistake in posting, because the account to debit or credit is shown at the head of each column, and whether the entry should be made in the debit or in the credit column, is also indicated. When all postings have been made, we have the following information:

1. Cash received and cash disbursed during the month; the balance of cash on hand.
2. Accounts payable, and accounts payable, paid; the outstanding account payable, or the amount of liability still to meet.
3. Charges to customers, and payments from customers; the total amount still due from customers.
4. Income classified according to source.
5. Capital expenditures.
6. Material inventory account.
7. Overhead charges for the month.
8. Selling expense.
9. Operating expense, sub-divided by:
   (a) Labor.
   (b) Material.
   (c) Expense.
10. Individual charges against contract numbers.

In addition to this we have a medium for posting to individual accounts in the Purchase Ledger, and the Customers' Ledger. The convenience of this form of record is being increasingly appreciated by hundreds of bookkeepers in all branches of industry, and we have yet to learn of one who has reverted to the older methods, after once giving this a trial.

DISTRIBUTING OVERHEAD EXPENSE

There remains but one thing more to mention. After the columns have been totalled and the totals have been posted to the ledger, the overhead expense should be distributed over the operating accounts, as shown by the starred entries. These are made *after the columns have been totalled*, not before, and they are *additional* postings to the ledger accounts concerned. Care must be exercised to see that no amounts are shown in the general expense columns that should be spread over a period of time. Insurance premiums, for example, cannot be charged direct to expense that will be distributed over *one* month's operation.

To take care of this, it is necessary to mark such items as cover more than one month's expense, and post them to a Suspense Account, relieving this account of its monthly proportion, each month, until the item is cleared off. Another method would be to make the "Interest and Discount" column, a "Sundries Account" column, and use this for Suspense, Interest, and Discount, making a summary for each account at the end of the month.

The importance of accuracy and completeness in the initial stages of bookkeeping routine cannot be over-emphasized, and this simple but effective form insures such accuracy, if entries are made in accordance with the rules outlined in this article. Having once grasped the principle, the reader will have no difficulty in extending the classification, or revamping the columnar headings to meet any particular requirements that may exist in his business.

Water Heating and Steam Pipe Chart

Successful Graphic Method for Determining Amount of Steam Required and Size of Steam Pipe

By John H. Gibson

Manager Philadelphia Branch, Whitlock Coil Pipe Company

ONE of the problems frequently confronting the plant engineer of a manufacturing organization is to determine the amount of steam required to perform a specified duty and what size steam pipe to use. This question presents itself particularly in the installation of a water heater to heat water for boiler feed, hot water service, or process purposes. Also in fuel-oil heaters and similar steam-condensing apparatus, if care is not observed in figuring an answer to these questions, the chances are that there will not be sufficient steam capacity installed to take care of the additional load, or the steam pipe to the heater will be made too small to adequately provide for the quantity of steam required. The writer has observed so many installations where the solution of this problem has been disregarded and substituted by an assumption, that he has designed the hot water and steam pipe chart, herewith illustrated, to attain the answer quickly and accurately.

DESCRIPTION OF THE CHART

The chart is divided into two parts, each of which may be used independently of the other.

1.—To determine the quantity of steam that will be required to heat a certain quantity of water through a given temperature range; or the reverse, to find the amount of water heated through a given range that will be required to condense a given amount of steam.

2.—To determine the size steam pipe necessary to carry a given quantity of steam; or the reverse, to find how much steam a given pipe will convey at a certain velocity.

The chart is prepared on semi-log co-ordinate paper and therefore uniform in structure with straight and parallel lines. This makes it easily read with a degree of accuracy suitable for engineering purposes. The chart is most easily read by turning on its side so that all figures can be read upright without further shifting.

APPLICATIONS OF THE CHART

To work out a problem of the first type mentioned above, start on the chart at the top under the heading "Water Heated—gal. per hour." Follow the vertical line down until it intersects the oblique dotted line marked 120° at the right top. The 120° line acts as a turning point, except when the temperature range desired is 120°. For a temperature range other than 120°, turn to the right or left horizontally, as the case may require, in order to intersect the required temperature range line. From here turn down and follow the vertical line to the bottom scale, which will show the amount of steam required.

If the amount of steam available is known and it is required to find how much water will be heated through a given temperature range, start at the bottom scale marked "Steam—lbs. per hour," and trace the process in the opposite direction.

The second part of the problem, to find the size of steam pipe required, is solved as follows:

After finding the amount of steam required (at the bottom of the chart) retrace the line vertically upward until you intersect the given steam-pressure line, then proceed horizontally to the left until intersecting the steam-velocity line selected as reasonable for the conditions in question. From here turn vertically upward to the top of the chart and read the size of steam pipe. The scale at the very top marked "Pipe Area" gives the internal cross-section area of the pipe in square inches. Since the nominal size pipe is given, the pipe area scale need not be used except when figuring on pipe other than standard weight, such as extra-heavy or a seamless tube.

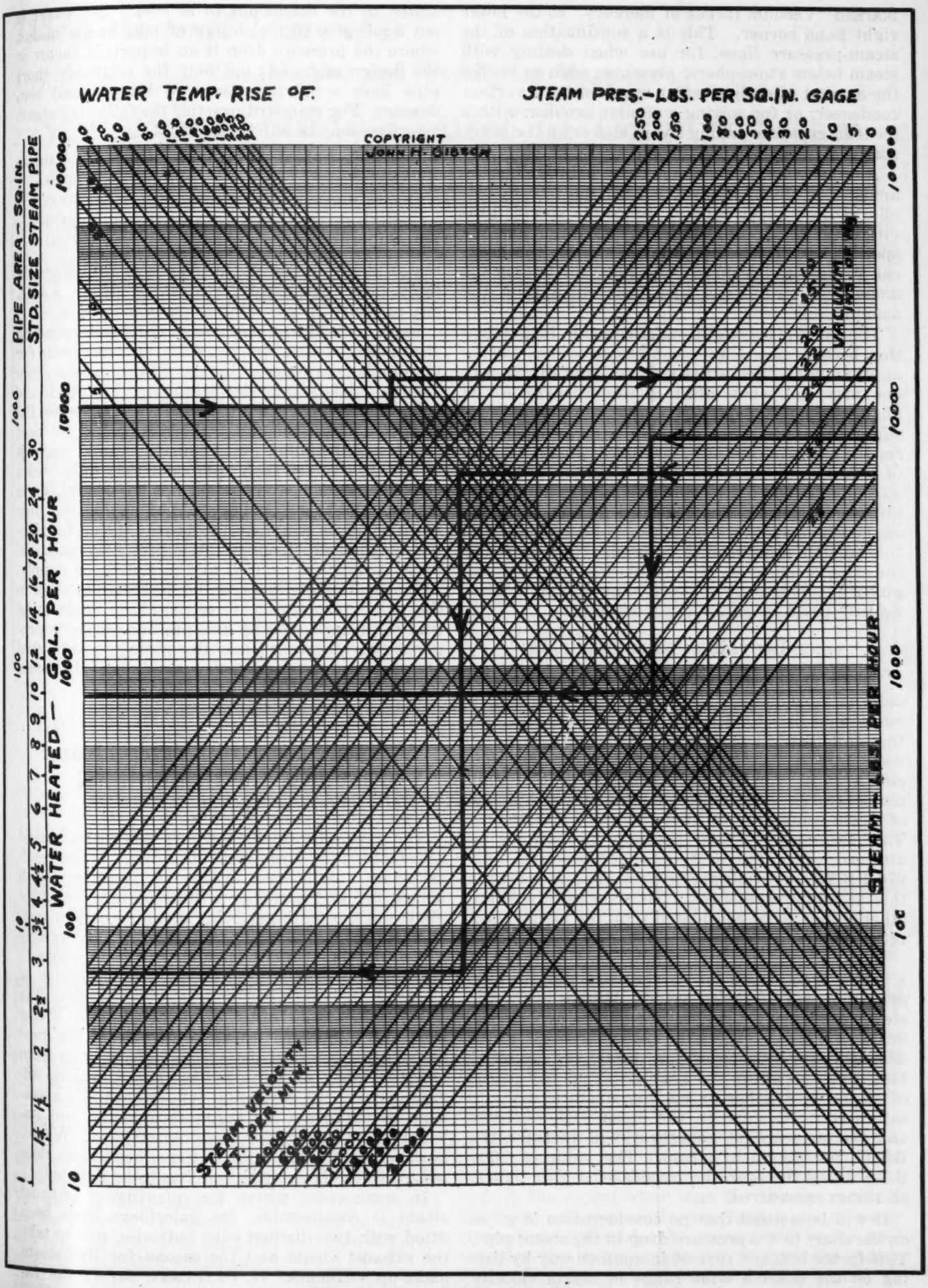
WORKING OUT A TYPICAL PROBLEM

To better illustrate an application of the chart, a typical problem will be worked out. Suppose an industrial plant requires 10,000 gal. per hour of water at 190° F. for manufacturing purposes; the water being drawn from a source having a winter temperature of 40° F. There is available for this work exhaust steam from various engines and pumps, and it is estimated that after taking care of the boiler-feed heater, there is left 7500 lbs. per hour of exhaust steam.

Turning to the chart we find, to heat the 10,000 gal. per hour of water through 150° temperature range, it will require 12,500 lbs. per hour of steam. Since only 7500 lbs. per hour of exhaust is available, the remaining 5500 lbs. per hour will have to be furnished by live steam from the boiler at 100 lbs. gauge pressure.

It is now required to find what size steam mains are needed to supply the exhaust and live steam heaters to do this work. Turning again to the chart, we find the 7500 lbs. per hour of exhaust, with a velocity of 6000 ft. per minute, will require a 10-in. main; and the 5500 lbs. per hour of live steam, at a velocity of 8000 ft. per minute, will require a 3-in. pipe.

The chart is provided with a number of fine lines



Water Heating and Steam Pipe Chart

marked "Vacuum inches of mercury" at the lower right hand corner. This is a continuation of the steam-pressure lines, for use when dealing with steam below atmospheric pressure; such as to find the amount of cooling water required for a surface condenser, or for solving a similar problem with a feed-water heater taking steam bled from the lower stages of a condensing turbine.

Another application of the chart is in finding the amount of steam needed to heat the heavy fuel-oils, as used under boilers. Since the specific gravity of a 10° B. oil is the same as water and the specific heat is one-half that of water, the chart can be used as previously described for finding the amount of steam, and then take one-half of the amount indicated.

The chart is especially satisfactory in its application because the solution of any problem may be approximately reached at a glance, and in this way one may tell what effect it would have on the answer if one or more of the given conditions were slightly changed. For example, suppose in solving for the size of steam pipe, you used a steam velocity of 6000 ft. per minute as being reasonable, and the size pipe turned out to be a size larger than a pipe already installed. You could see at once from the chart what steam velocity would be necessary if this smaller pipe were to be used. Then knowing the circumstances of the installation, use your engineering judgment to determine if this higher velocity could be safely depended upon.

CONSTANT USED IN DESIGNING CHART

The value of any chart depicting engineering data is considerably limited, unless the user is made acquainted with the factors and constants that enter into its design. The following constants were used in this chart: The specific heat and specific gravity of water were taken at unity for all temperatures. It was also assumed that each pound of steam would give up 1000 B.T.U. on condensing. This assumption would probably not always be attained, since the heat of vaporization is only 970.4 B.T.U. at atmospheric pressure and less than this at higher pressures. Nevertheless there are other things to be considered than the actual theoretical figures.

In actual practice it is usually found that unless a heater is too small for its requirements, the condensation will be cooled several degrees below the steam condensing temperature before leaving the heater. This is especially true if the heater is designed on the counter-flow principle. Another fact that will affect the heat given up per pound of steam, is whether or not the steam is dry and saturated. Moisture in the steam will decrease and the presence of superheat will increase the B.T.U. per pound of steam. The value of 1000 B.T.U. may therefore be considered a fair figure, all things considered.

It will be noticed that no consideration is given on the chart to the pressure drop in the steam pipe. This factor is taken care of in another way by listing on the chart a wide range of steam velocity lines, from which the user can select a value best suited to the conditions to be met. The chart is not applicable to the design of long steam mains, where the pressure drop is an important factor in the design and cost; but only for relatively short pipe lines supplying steam to heaters and condensers. For standard practice the following steam velocities may be safely used:

Quality of Steam	Feet per Minute
Exhaust	5000
Low pressure, dry saturated	6000
High pressure, dry saturated	8000
Superheated	10000

For determining the proper size of automatic temperature regulator for a water heater, a velocity of 10000 ft. per minute is recommended.

Some consulting engineers are recommending steam velocities as high as 20,000 ft. per minute for power plant practice. Such a velocity would probably be satisfactory for supplying high-pressure superheated steam to a prime mover, but when the steam is to be consumed in transferring its heat to a liquid, a number of conditions would make it undesirable to use such high velocities. The steam velocity into a heater should not be so high as to damage the tubes by impact, nor should the pipe be so small as to create the possibility of furnishing insufficient steam or at a pressure much reduced from that carried at the source of supply. The operating engineer would do better to stick to the more conservative velocities, keeping in mind that with high velocity the pressure drop is proportionally increased and the piping is subjected to a greater operating strain, especially if the steam contains moisture.

Vertical Type of Water Heater Favored for Institutional Work

The type of calorifier which has proved most satisfactory for large institution work is the vertical type, a mild-steel cylindrical container with domed top and a copper U-tube battery, the tube plate and the container being mounted upon a cast-iron steam chest. Such calorifiers are invariably installed where there is sufficient head room to erect lifting gear. In such cases the operation of cleaning the tubes is comparatively simple. The mild steel water container is fitted with lifting eyes and is hoisted up and away from the tube plate, when the tube battery is quite easy to clean *in situ*. Such an arrangement has a decided advantage over the horizontal type, where it is necessary to withdraw and support a heavy and unwieldy tube battery for cleaning purposes. Where, however, in the older institutions, head room does not exist, the horizontal type has to be adopted.

In some cases where the quantity of exhaust steam is considerable, the calorifiers have been fitted with two distinct tube batteries, one to take the exhaust steam and the second for live steam make-up.—HERBERT G. CATHCART, *before the Institution of Heating and Ventilating Engineers.*

This is the tenth lesson of

The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Instruction in this course is available only to subscribers of The Heating and Ventilating Magazine. The first lesson appeared in the November, 1924, issue. However, students can commence the course at any time. Immediately upon receipt of your enrollment, Lesson 1 will be sent to you, together with the Work Problems pertaining to Lesson 1. Full directions will be included as to where to send your solutions of the Work Problems.

The complete course consists of not less than 30 lessons. The first five lessons are devoted to the fundamentals of heating and ventilation. The second section, commencing with Lesson 6, is devoted to gravity water heating. This will be followed in due course by sections on radiators and radiation, gravity steam heating, steam and water boilers and cost estimating.

The cost of the complete course, including a critical analysis of the Work Problems as solved by each student, is $80.00, payable in equal monthly installments of $10.00. An enrollment blank will be sent you upon request, together with full directions for securing all the benefits of the course.

Students who satisfactorily complete the course will be awarded a Graduation Certificate which will correspond in value to the character of the lessons themselves.

SPECIAL NOTICE—Effective September 1, the price of THE HEATING AND VENTILATING MAGAZINE'S Home Study Course in Gravity Steam and Water Heating will be $100.00. This advance in the price of the course has been found necessary due to the amount of work involved in the handling of the lesson sheets and to the fact that each student is now supplied with the text and problem sheets in convenient loose-leaf form, arranged by colors for different parts and fully indexed for future reference. In this way each subscriber to the course who completes the lessons will possess a complete reference handbook which eventually will cover the entire field of heating and ventilation.

Lesson No. 10—Single-Main Circuit System. One-Pipe Down-Feed System. Expansion Tanks and Connections

By *Ara Marcus Daniels*

EDITOR'S NOTE—*Due to an oversight, which we greatly regret, credit for the subject matter appearing in Lesson 9 was inadvertently omitted. This material, in substantially the same form, appeared in* THE PLUMBERS TRADE JOURNAL, STEAM AND HOT WATER FITTERS REVIEW, *for February 1, 1925, under the authorship of T. F. Moffett.*

Single-Main Circuit System

THE two-pipe circuit system of water heating is somewhat similar to the one-pipe up-feed system illustrated in Fig. H-3-1. A typical layout for the circuit system is shown in Fig. H-5-1. In this system the main is carried around the basement ceiling until the return riser from the last radiator served enters as at point A, Fig. H-5-1. The main is then dropped and enters the boiler at the low point of the system. Or, it may be carried to a point directly over the boiler and then dropped to the boiler return connection.

(*Copyright, 1925, Ara Marcus Daniels.*)

This single-pipe circuit basement main is graded up from the boiler outlet, point B, to the last riser connection, as at point A. When in operation, friction in the main assists the circulation into supply risers.

In designing and installing this system, it is important that each supply riser should be taken from the main as near the boiler supply outlet as convenient, as at point C, Fig. H-5-1, and that the return drop-riser connection be made at a point as far removed from the supply connection as possible, as at D, Fig. H-5-1.

The friction in the pipe between the supply tee and the return tee, although slight, results in a little greater tendency for the water to flow into and up the supply riser than for it to pass along the main. Consequently, the farther apart these connections are made, the greater will be the tendency of the water to circulate through the radiators. This fact should be carefully observed in planning this type of system.

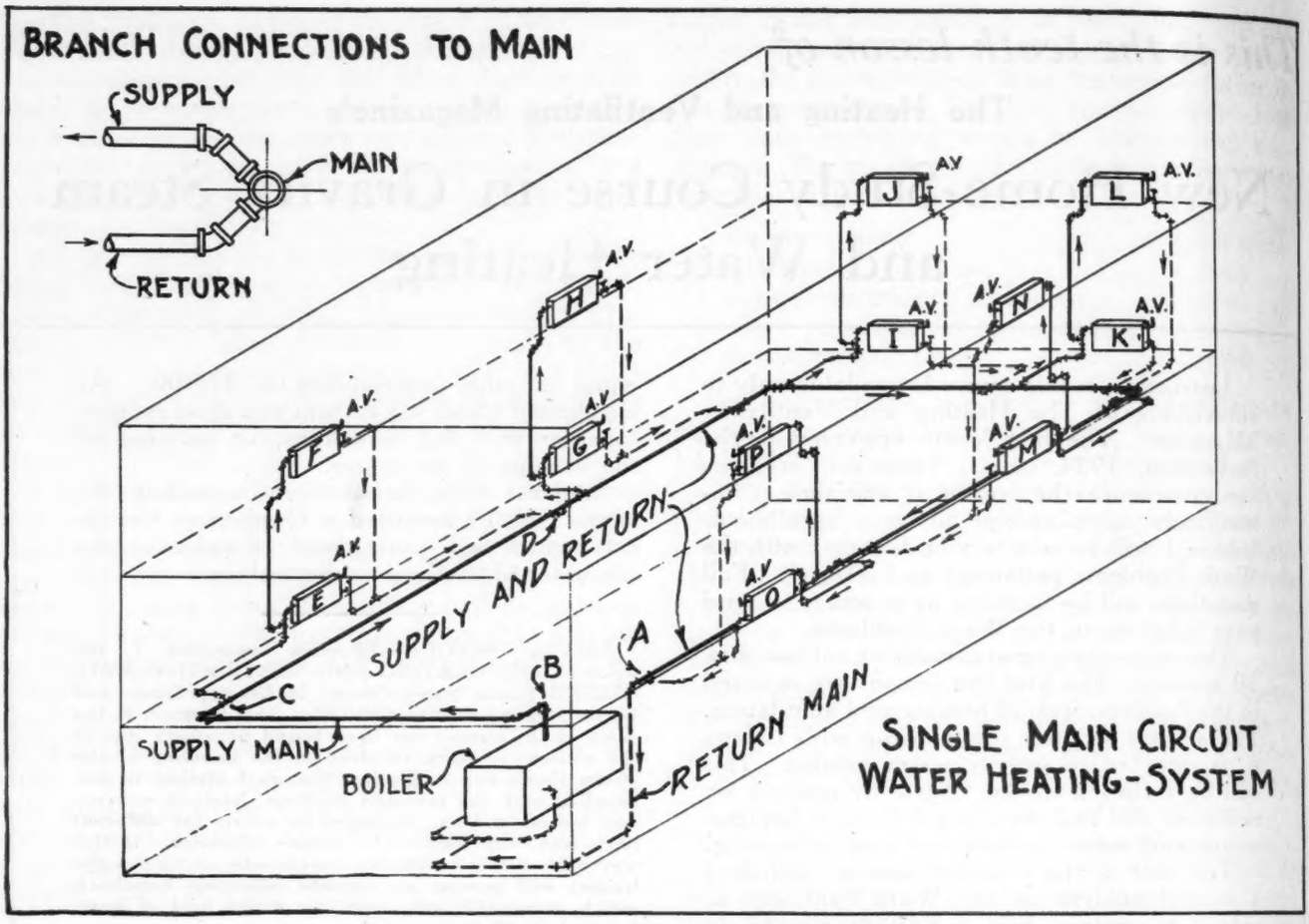


Fig. H-5-1. Single Main Circuit Water Heating System.
(Used with assigned Problem H-5-1)

The main should be carried full size throughout the entire circuit, that is, from point B to point A, Fig. H-5-1. It should be proportioned to carry the total radiation load. Theoretically and practically, too, the main might be reduced between radiator supply and return connections since some of the water is shunted through the radiator. In fact, it is good policy to reduce the main between such points in order to assure more positive circulation to and from the risers.

All supply branch connections should be taken off the main with a Style B (See Fig. H-2-2) connection and all return risers should be made with a Style C connection. The proper connections are also shown in the upper left corner of Fig. H-5-1.

Reasonable satisfaction may be expected from a circuit-main system of small size, but its use is not recommended for the larger installations. Full-size radiator tappings should be used. Pipes may be proportioned from Tables H-1-3 and H-1-1 or Table H-1-2. It is often advisable to increase the required area of radiators near the end of the main by 10% to compensate for the somewhat lower temperature of the water supplied them.

Work Problem H-5-1

One-Pipe Down-Feed System

A typical layout of strictly a one-pipe down-feed gravity water heating system is shown in Fig. H-5-2. The layout shown in Fig. H-4-1 was an adaptation of this system to a rather unusual condition.

In order that this one-pipe down-feed system may function properly, it must be installed as shown with an overhead supply main and a low return main. The radiators are tapped top and bottom usually with tappings on the same end, as shown in Fig. H-5-2, or the return may be taken out the opposite side from the supply.

It is best to reduce the size of the drop riser between the supply and return tees to the radiator in order to assure more positive shunting of part of the flow through the radiator. Generally, this is not done. The circulation will usually be satisfactory because the unit weight of water in the radiator is greater than that in the riser which is caused by a cooling and contracting of the water in the radiator. A reduction in the size of riser will much improve the circulation.

No air-valves are necessary with this system for small and medium-size installations. For large jobs, such as that shown in Fig. H-4-1, they should be used as explained. The system is vented to the high point from where a vent pipe is carried to an expansion tank.

The temperature of the water in the drop constantly decreases. In a building of considerable height, this reduction of temperature in the supply, caused by the dumping of cooled water into the drop riser from radiator returns, may be serious enough to require increased radiating surface for

the lower radiators in order to compensate for the cooler water delivered into them. This condition constitutes the chief objection to the wider use of this system.

In order to prevent damage to the boiler, in case valves on both supply and return mains are closed at the same time, a relief valve should be placed on the boiler.

This system of heating by gravity water circulation is probably the cheapest of any of the methods of piping such a system but is not as satisfactory as a properly-designed two-pipe system where supply risers convey only supply and return risers only return water.

PROPORTIONING PIPES

In proportioning the mains and radiator connections, the branch size to each radiator is first determined. The exceedingly low head available between the top and bottom radiator connection, as explained above, requires the use of full-size standard radiator tappings for the run out and valve in order to assist circulation to and from the radiator as much as possible. The size of radiator valve and return connection may therefore be taken from Table H-5-1.

Work Problem H-5-2

The size of risers may be developed from sizes of radiator valves and return connections, using Table H-1-1 or H-1-2. The main also may be proportioned by using either of these tables.

Work Problem H-5-3, H-5-4

TABLE H-5-1
STANDARD RADIATOR TAPPINGS
WATER RADIATORS
TAPPED FOR SUPPLY AND RETURN

RADIATOR SIZE	TAPPING SIZE
UP TO 40 SQ. FT. INCLUSIVE	1" AND 1"
ABOVE 40 SQ. FT., UP TO 72 SQ. FT.	1¼" AND 1¼"
ABOVE 72 SQUARE FEET	1½" AND 1½"

DETERMINING RISER SIZES BY HEIGHT OF RADIATOR ABOVE BOILER FOR ANY SMALL GRAVITY WATER HEATING SYSTEM

Circulation of water in a riser of any water heating system is governed by two factors, the height of the riser and the temperature of the water therein. The size of the radiator return connection does not govern, but influences, the circulation. The cooling effect of the radiator is the great influencing factor, for this lowering of the temperature, with consequent increase in specific density of the water, causes circulation—with no cooling effect there would be no circulation.

Therefore, if, in the problem assigned for Fig. H-5-2, all radiation on each drop riser were located the same distance above the boiler, the size of the drop riser could be taken directly from Table H-5-2.

This table shows the amount of equivalent direct radiation that can be supplied satisfactorily at the elevation above the boiler, as given at the top of each column. The elevation is measured from the horizontal center-line of the heater to the hori-

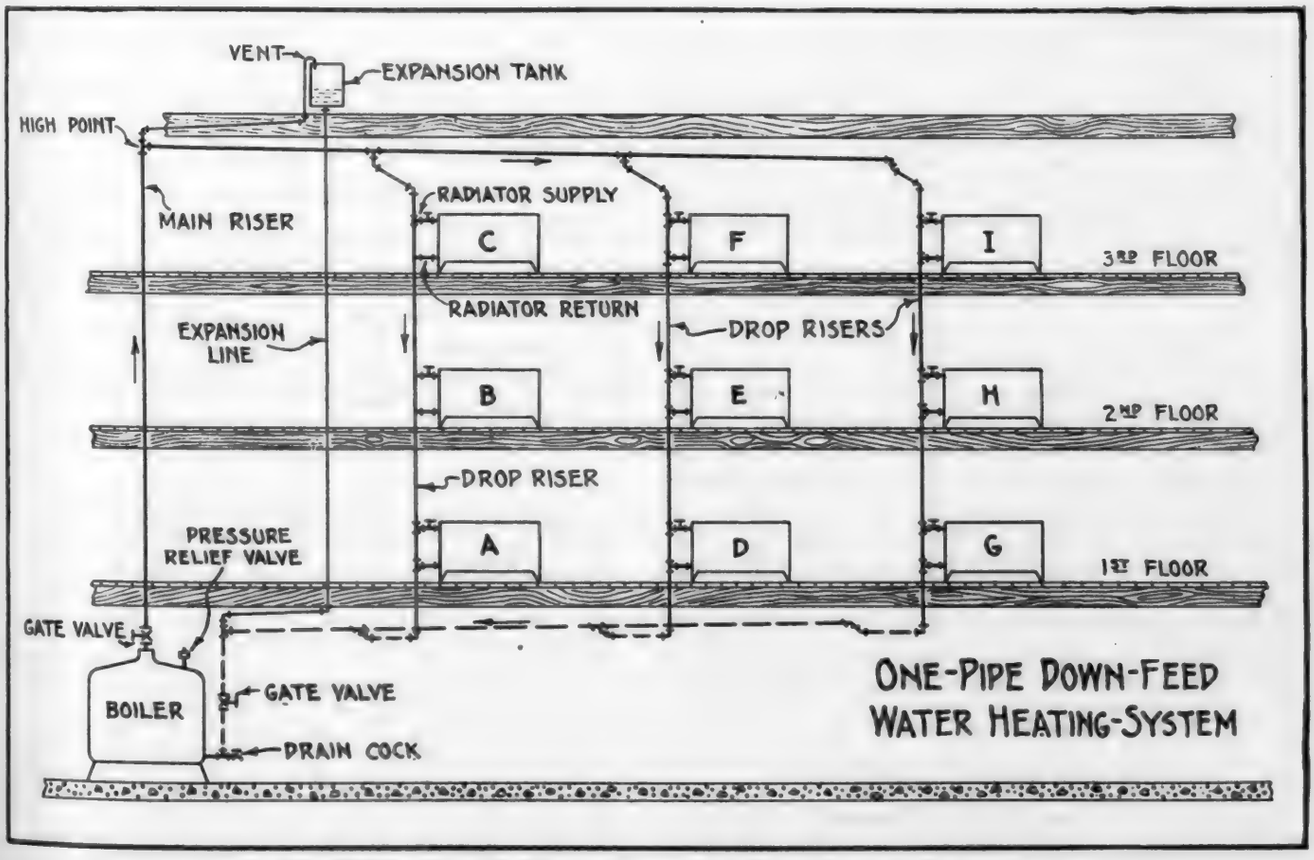


Fig. H-5-2. Typical One-pipe Down-feed Water Heating System.
(Used with assigned Problems H-5-2 to H-5-4 inc.)

zontal center-line of the radiator. Thus, for 250 sq. ft. of radiation located 5 ft. above the boiler center line, a 2-in. pipe is required, whereas if this amount of radiation were located 50 ft. above, a 1½-in. pipe would be ample.

Work Problem H-5-5

The average temperature of the water in a riser will determine the riser size. This can be found by determining the equivalent elevation at which all the radiation might be placed to produce the same effect. This may be done as follows:

First: Multiply the area in square feet of each radiator by the vertical distance in feet that it is located above the boiler. This should be done for each radiator.
Second: Add all these products and note their sum.
Third: Determine the total radiating surface of all radiators fed by a given drop riser.
Fourth: Divide result SECOND by result THIRD and obtain equivalent distance in feet of all radiation above the boiler for a particular riser.
Fifth: Refer to Table H-5-2 and select the proper size riser for the total radiation (result THIRD) when located at the average elevation (result FOURTH).

Work Problem H-5-6

Expansion Tanks and Connections for Open-Tank Water Heating Systems

As the temperature of water is raised, its volume increases—as the water cools, its volume decreases. Consequently, in a water heating system provision must be made to care for the expansion and contraction of the water. Steel tanks, commonly called expansion tanks, are used for this purpose. They have been included in the typical layouts of the different types of systems covered in previous lessons.

SIZE OF EXPANSION TANK REQUIRED

The size of the expansion tank depends upon two factors: (1) the amount of water in the system, (2) the range in temperature through which the water may pass from a cold to a hot system.

If the temperature of a given weight of water be raised from 32° to 212° F., its volume will increase approximately 4.33%, that is, the volume of a given quantity of water at 212° F. will be about 1/23 greater than its volume at 32° F. Thus, for every 23 gal. of water in a water heating system when the system is cold (assumed at 32° F.), there should be an allowance of 1 gal. in the expansion tank when the system is hot (assumed at 212° F.).

Work Problem H-5-7

VOLUME OF RADIATORS AND PIPE

Cast-iron radiators have an internal volume of about 1½ pints per square foot of radiating surface. Steel radiators and 1-in. pipe hold about 1 pint per square foot of radiating surface.

TABLE H-5-2
HOT WATER PIPE SIZES
FOR
SMALL GRAVITY SYSTEMS

DIAMETER OF PIPE AND SIZE OF RADIATOR VALVE - INS.	HEIGHT OF ℄ OF RADIATOR ABOVE ℄ OF BOILER								
	5	15	25	35	45	55	65	75	85
¾	40	50	60	70	80	90	100	110	120
1	70	80	90	100	110	120	130	140	150
1¼	110	117	135	147	170	187	205	222	240
1½	180	195	210	230	245	260	275	295	310
2	300	375	450	500	575	650	700	777	850

It may be assumed safely that the internal volume of the radiators in a water heating system is about 50% of the volume of the entire system including piping, radiators and boiler. On this assumption, a system consisting of 2400 sq. ft. of direct cast-iron radiation would have a capacity of 2400 (sq. ft.) × 2 (50% total capacity) × 1½ (pints per sq. ft.) = 7200 pints or 900 gallons.

Work Problem H-5-8, H-5-9

If the water contained in the system of the above example were to be heated from 32° to 212° F., the increase in volume (in gallons) would be 900 (gal.) ÷ 23 (proportional increase) = 36 gal. (appx.).

Work Problem H-5-10

For practical reasons, the capacity of expansion tanks should be made somewhat larger than the theoretical volume required. The tank for a given system should be not less than 25% in excess of that figured as explained above. Therefore, the capacity of the tank for a system in which the increase in water volume is 36 gal. would be 1.25 × 36 = 45 gal. capacity.

Work Problem H-5-11

Table H-5-3 contains capacity sizes and rated radiation capacity for stock expansion tanks. These tanks are made of steel, heavily galvanized. They are tapped top and bottom generally 1-in. for overflow and expansion lines and on the side for a feed pipe. Water-gauge tappings on the side are usually ½-in. on 13½-in. centers.

Work Problem H-5-12

TABLE H-5-3 EXPANSION TANK SIZES

NO.	SIZE - INCHES		GALLONS	SQUARE FEET OF RADIATION DIRECT
	DIAMETER	HEIGHT		
0	10	20	8	250
1	12	20	10	300
2	12	30	15	500
3	14	30	20	700
4	16	30	26	950
5	16	36	32	1300
6	16	48	42	2000
7	18	60	66	3000
8	20	60	82	5000
9	22	60	100	6000

In Fig. H-5-3, various methods for piping expansion tanks are shown. Detail 1 of this figure shows the connection of the expansion tank for a one-pipe up-feed system. (See also Fig. H-3-1.) The open tank should be installed at a suitable elevation with the bottom of the tank at least 3 ft. above the top of the highest radiator. (See details 2 and 3, Fig. H-5-3.) It is well to connect the expansion line to the nearest return riser, as shown in Detail 3. Preferably, a separate expansion line is run to the flow or return main in the basement, as shown in Fig. H-3-1.

In small installations, principally residential plants of only moderate size, the expansion line is connected to the return riser of one of the highest radiators and no overflow other than the vent is provided. Unless extreme economy is required, this method is not advised as it is distinctly a cheap method. When connections are made as in Detail 3, Fig. H-5-3, no means are provided for circulation and it is necessary that the expansion tank be located in a space where there will be no danger from freezing temperatures. The vent or overflow usually is discharged upon the roof.

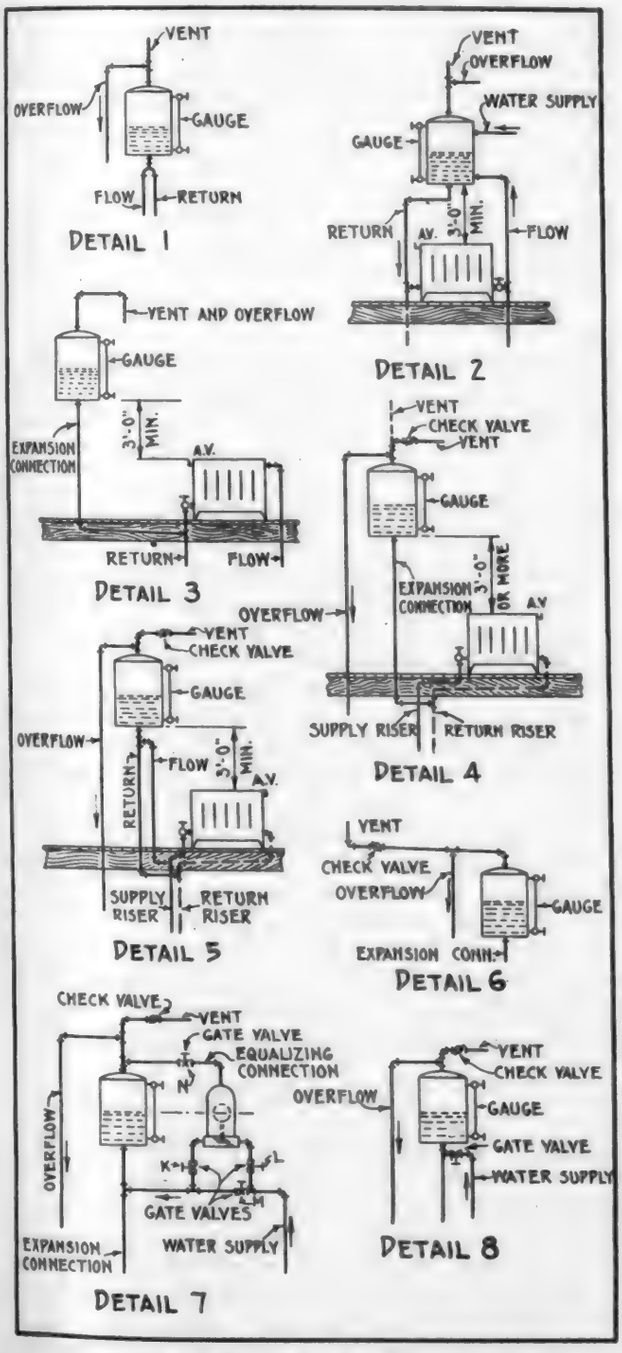


Fig. H-5-3. Expansion Tank Connections.
(Used with assigned Problems H-5-13 to H-5-20 inc.)

Work Problem H-5-13

Detail 4, Fig. H-5-3, shows a quite general method of connecting up the expansion tank and the highest radiator nearest it. The connection to the bottom of the tank is taken from the return riser. An overflow connection is taken off the top from the side outlet of a tee and led downwards. The vent connection, shown as a dotted line, is carried directly upwards. This vent prevents the system from siphoning out when it is overflowing for, by being located at the extreme top of the system, air is admitted as soon as a suction is established by the downward moving current of water in the overflow.

This method of connections presents two possible sources of trouble: (1) the vent or overflow connection, if open directly to the outside atmosphere results in serious damage to the boiler in case the exit of either pipe becomes blocked by freezing; (2) the overflow pipe, if run to some convenient toilet fixture near the tank (and this is not unusual) may result in continuous wastage of water in case the water supply valve is defective or is not fully closed.

This overflow line should always be carried to the basement and discharged near a floor-drain above the floor line when such a drain exists. Thus any defect that may develop in the water supply valve will be known by the flow of water.

The better method for making the vent connection is to use a check valve of the "swing" type, shown by full lines, with the gate opening inwards. This will prevent water from escaping if it should happen to boil violently and will open instantly and admit air should siphoning begin.

Work Problem H-5-14

It is always preferable to locate the expansion tank in a heated space, but in case it is not so placed (sometimes it is installed in an unheated attic space) the tank should have an insulating covering applied. It should also have a circulating connection to guard against the possibility of freezing. Detail 2, Fig. H-5-3, shows one method of connection. In using this method, the supply connection should be made on the side as near the bottom as possible. Detail 5, Fig. H-5-3, however, shows a better way to make the connections and is particularly suited to tanks that have only top and bottom tappings.

Work Problem H-5-15

Expansion-tank connecting piping need not be large. For installations up to 1000 sq. ft. of radia-

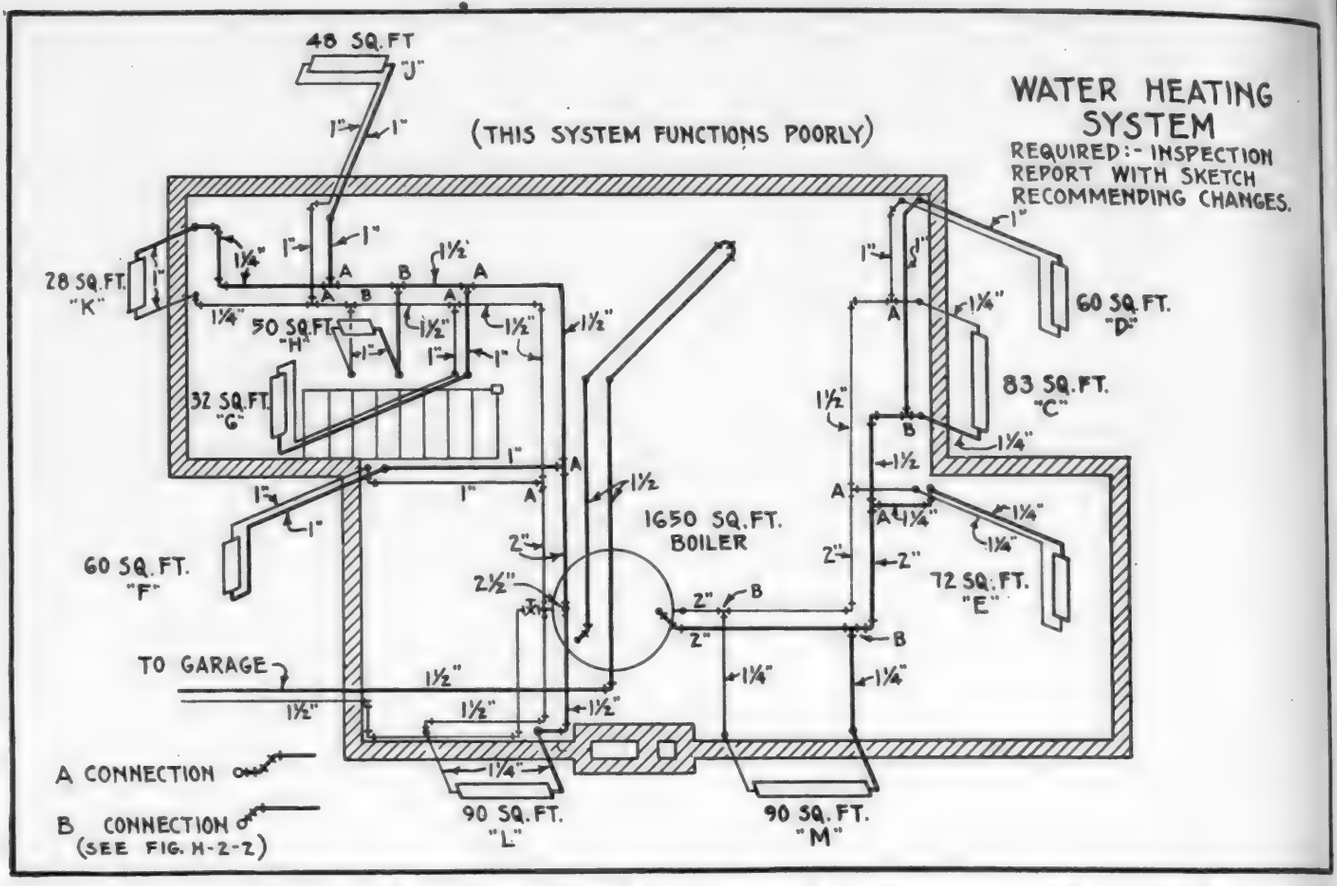


Fig. H-5-4. Basement Plan of a Water Heating System that Functions Poorly. An Inspection Report with Recommendations is Required on This Layout.

(Used with assigned Problem H-5-21)

tion, a ¾-in pipe is ample for expansion and overflow lines. This size should be increased by one pipe size for every 1000 sq. ft. of radiation in excess of the first 1000 sq. ft. This proportion may apply up to 5000 sq. ft. Above this amount, the increase should be one pipe size for every 2500 sq. ft. in excess of 5000 sq. ft.

The "swing" check valve on the vent or siphon-breaker line should be ½ in. for installations up to 1000 sq. ft. For larger installations, it should be made one-half the diameter of the expansion and overflow pipe.

Work Problem H-5-16, H-5-17

Detail 6, Fig. H-5-3, shows a connection often employed in cold climates. This vent and overflow connection is used where there is a liability of the vent line freezing (if run out through the roof) caused by the condensation and vapor as it passes out through the line becoming cooled and finally freezing. Most of the vent line should be kept within the building and to assure this it is installed only 2 ft. high above the tank. It is equipped with a check valve to prevent the escape of water through it in case the tank should overflow suddenly. When the check valve closes, the excess water will pass down the overflow and prevent any flooding.

Work Problem H-5-18

AUTOMATIC WATER-FEEDER FOR HOT WATER SYSTEM

Detail 7, Fig. H-5-3, shows an expansion tank and connections including an automatic water-feeder. This is a desirable addition to any water heating system. By its use the water is maintained at the desired level in the tank without attention. If the radiators are periodically vented and no automatic water-feeder is installed, the addition of make-up water may become bothersome. In addition to the water regulator, its inclusion requires also four gate valves and a little more piping. Valves K, L, and M are by-pass valves. Normally, valve M remains closed, with K, L and N open. If the feeder is disconnected for examination and repair, these three valves are closed and the system is fed through valve M. The height of the water-line in the tank is governed by means of the equalizing connection line containing valve N.

Work Problem H-5-19

Detail 8, Fig. H-5-3, shows connections for feeding water into the system with the automatic feature eliminated. This arrangement should always be used when the heating system is fed by a pump directly from a well or cistern so that any air entrained in the water can escape directly into the overflow. It is especially convenient to have two feed connections to the system, one at the tank

(*Continued on Page 67*)

Heating New England Homes with Gas

How the Gas Companies in That Section Have Developed the House-Heating Load. Co-operating with Heating Contractors

RESIDENTIAL heating with gas in New England dates back some eleven years. The inception, and a large amount of credit for the after development may properly be laid to C. S. Hilton, of The Pawtucket Gas Company, who modestly functions as the leading spirit in the industrial use of gas in his community, with no title that could be discovered.

The story of why the first domestic gas installation was made has been lost, but the fact remains that it was sufficiently successful to lead to further effort, and today Pawtucket leads New England in the number of domestic installations. The Pawtucket Gas Company being one of the Stone & Webster properties, it is but natural that the other New England properties operated by them should follow the experiments made in Pawtucket with great interest. As a result, there were served, during the past heating season, by the Stone & Webster properties, at Pawtcuket, R. I., Woonsocket, Fall River and Haverhill, Massachusetts, probably one-half of the total number of installations in the New England States. On this account, and as the development at Pawtucket has been carried out with such evident regard for the future possibilities, it is interesting to outline what has been accomplished at this focal point. Activities in other New England cities will be considered in the September issue.

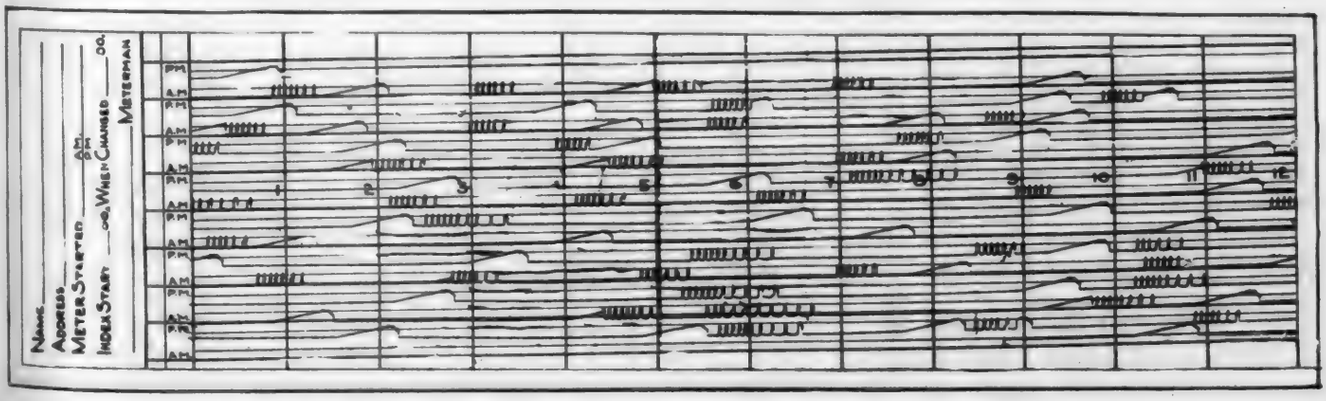
THE FIRST THERMOSTATICALLY-CONTROLLED INSTALLATION IN NEW ENGLAND

The story of the first installation is an interesting one, and the influence of its owner, a prominent manufacturer, as a satisfied customer, is increasing as time goes on. Nearly eleven years ago, this manufacturer, out of patience with the coal-burning installation in his home, and having in mind the various satisfactory applications of gas in his factory, approached the gas company, in the person of Mr. Hilton, and asked if it would not be possible to heat his home with gas. With no forerunner as a guide, and imbued with the idea that he could not disappoint a valued customer, Mr. Hilton glibly said that it could be done, and promised to prepare a proposition. With gas at $1.40 per thousand, it was obvious that the question of cost could not enter into the problem.

The one question required, as an answer, the production of a suitable gas-fired boiler. Not knowing of any commercial low-pressure gas-fired boiler, it was decided to convert a small high-pressure boiler by increasing the size of the inlet and outlet and the set of the blow-off valve. With only an elementary knowledge of the capabilities of such a boiler when used for low-pressure heating, a 5 H.P. size was selected, on the basis of 66% efficiency, and piped to 520 sq. ft. of connected radiation.

The next problem was to develop a burner to function automatically, and as there was no quick-action valve available, it was necessary to arrange for automatic pressure control only. As the air supply to the burner was set, it was obvious that a slow opening or closing of the valve would probably result in the inherent production of an explosive mixture, and a flare-back, on each operation. Without going into detail, it may be said that, after much drafting of suggested schemes, and tinkering in the shop of the gas company, a workable plan was developed and installed, making this the first thermostatically-controlled installation in this territory.

It is hardly necessary to say that the gas bills bore no resemblance to the previous cost of coal, but the maintenance of an incredibly uniform temperature through three New England winters dismissed all objections to high cost.



Typical Recording Gas Meter Chart Used to Study Gas Boiler Operation

COMMERCIAL POSSIBILITIES RECOGNIZED

In 1918, after having watched this installation and several others, made in the homes of officials of the gas company and others who would stand for the experiment, Mr. Hilton was convinced of the commercial possibilities of house-heating with gas, and made his next step. He proposed to the owner of the initial installation that a modern gas-fired boiler, then being marketed, be substituted for the make-shift, on the grounds of fuel economy. This change was made, and a No. 54-S Bryant boiler has, in the intervening eight years, developed heat in this home without the expenditure of a cent for repairs. It might be said that the thermostat is set for 72° F., during the entire heating season. The increased efficiency of this boiler over the one it replaced has had a decided effect upon the cost for fuel, and the owner states that the following table gives a fair and very accurate idea of his comparative fuel costs:

Cost of coal, 30 tons, at $16.00	$480.00
Labor for heating season	150.00
Ash removal	25.00
	$655.00
Average cost of gas, since new boiler installed	$550.00

The cost of attendance in this case was that of a laborer from the factory, who was charged for the time actually spent taking care of the house installation. The cost of coal is the cost of the quantity of coal previously burned, at the present price. It will be seen that the excess cost of gas over coal, disregarding the labor items, is slightly less than 15%.

It may be noted that the high consumption of 1920-21 was brought about by sickness through the greater part of the winter, and the low figure of 1918-19 resulted from the closing of the house for a month.

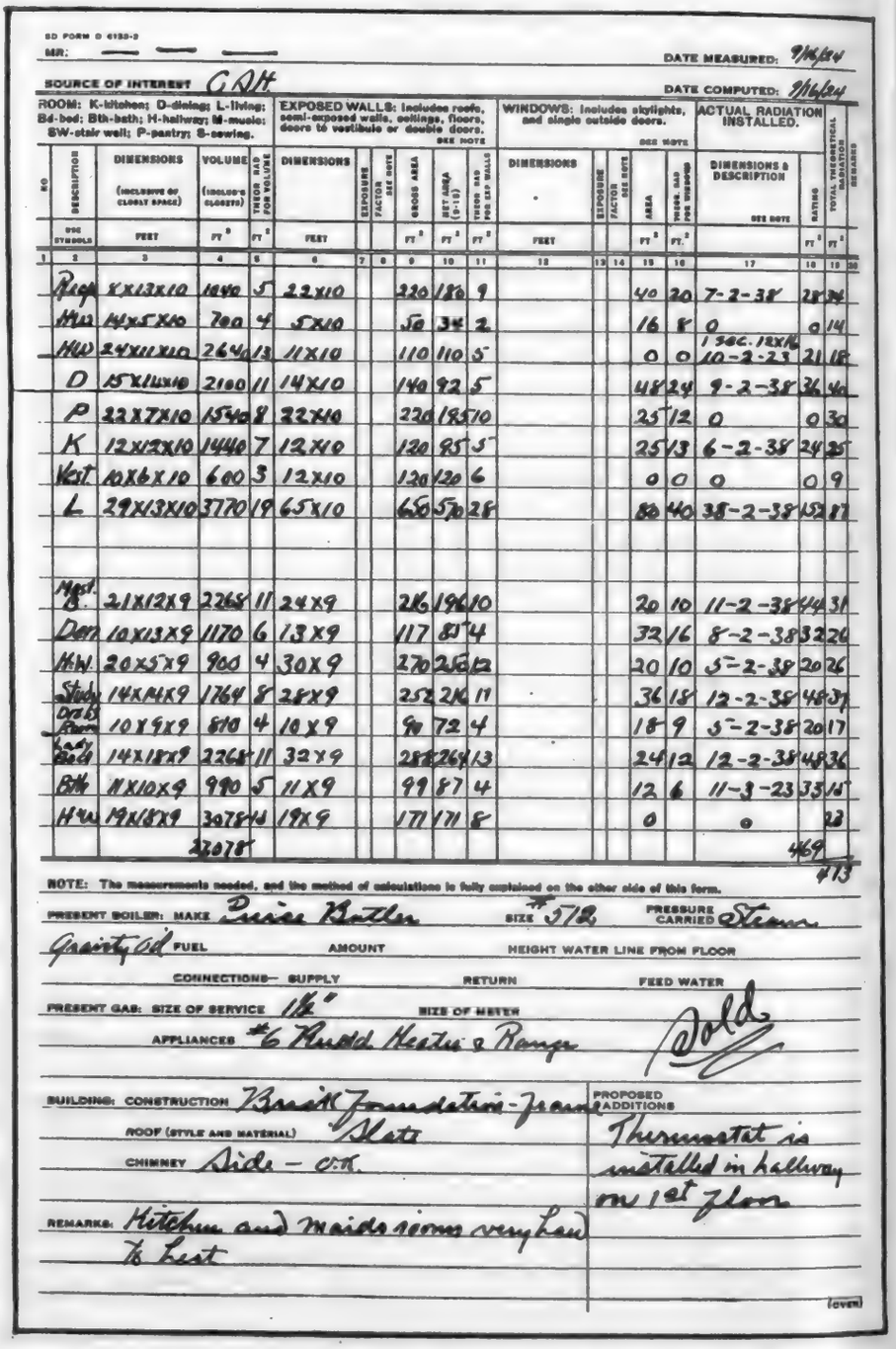
The Bryant boiler is rated at 1185 sq. ft., and there is connected to it 556 sq. ft. of direct radiation.

The annual gas consumption in this home, which is of frame construction with 14 rooms, has been:

Season of	Gas Consumption, Cubic Feet
1917-18	56,210
1918-19	45,000
1919-20	62,600
1920-21	75,550
1921-22	49,800
1922-23	57,400
1923-24	54,740
1924-25	49,120

STEADY GROWTH OF GAS HOUSE-HEATING IN PAWTUCKET

With this beginning, the heating of homes in Pawtucket has grown steadily and surely, each



SD FORM D 6130-D

MR: — — —

DATE MEASURED: 9/16/24

SOURCE OF INTEREST G.H.

DATE COMPUTED: 9/16/24

ROOM: K-kitchen; D-dining; L-living; Bd-bed; Bth-bath; H-hallway; M-music; SW-stair well; P-pantry; S-sewing.

EXPOSED WALLS: Includes roofs, semi-exposed walls, ceilings, floors, doors to vestibule or double doors. SEE NOTE

WINDOWS: Includes skylights, and single outside doors. SEE NOTE

ACTUAL RADIATION INSTALLED.

NO	DESCRIPTION (USE SYMBOLS)	DIMENSIONS (INCLUSIVE OF CLOSET SPACE) FEET	VOLUME (INCLUDES CLOSETS) FT.³	THEOR. RAD FOR VOLUME FT.²	EXPOSED WALLS: DIMENSIONS FEET	EXPOSURE FACTOR SEE NOTE	GROSS AREA FT.²	NET AREA (9-10) FT.²	THEOR. RAD FOR EXP. WALLS FT.²	WINDOWS: DIMENSIONS FEET	EXPOSURE FACTOR SEE NOTE	AREA FT.²	THEOR. RAD FOR WINDOWS FT.²	ACTUAL RADIATION INSTALLED: DIMENSIONS & DESCRIPTION SEE NOTE	RATING FT.²	TOTAL THEORETICAL RADIATION REQUIRED FT.²
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	Kit	8'x13'x10'	1040	5	22'x10'			220	180	9				40	20	7-2-38	28	34
	H.W.	14'x5'x10'	700	4	5'x10'			50	34	2				16	8	0	0	14
	H.W.	24'x11'x10'	2640	13	11'x10'			110	110	5				0	0	1 soc. 12x16 10-2-23	21	18
	D	15'x11'x10'	2100	11	14'x10'			140	92	5				48	24	9-2-38	36	40
	P	22'x7'x10'	1540	8	22'x10'			220	185	10				25	12	0	0	30
	K	12'x12'x10'	1440	7	12'x10'			120	85	5				25	13	6-2-38	24	25
	Vest	10'x6'x10'	600	3	12'x10'			120	120	6				0	0	0	0	9
	L	29'x13'x10'	3770	19	65'x10'			650	520	28				80	40	38-2-38	152	187
	Mast B.	21'x12'x9'	2268	11	24'x9'			216	196	10				20	10	11-2-38	44	31
	Den	10'x13'x9'	1170	6	13'x9'			117	81	4				32	16	8-2-38	32	20
	H.W.	20'x5'x9'	900	4	30'x9'			270	256	12				20	10	5-2-38	20	26
	Stud	14'x14'x9'	1764	8	28'x9'			252	216	11				36	18	12-2-38	48	37
	Orch Room	10'x9'x9'	810	4	10'x9'			90	72	4				18	9	5-2-38	20	17
	Lady Bed	14'x18'x9'	2268	11	32'x9'			288	264	13				24	12	12-2-38	48	36
	Bth	11'x10'x9'	990	5	11'x9'			99	87	4				12	6	11-3-23	35	15
	H.W.	19'x18'x9'	3078	15	19'x9'			171	171	8				0		0		23
			27078														469	413

NOTE: The measurements needed, and the method of calculations is fully explained on the other side of this form.

PRESENT BOILER: MAKE Burnie Boiler SIZE #512 PRESSURE CARRIED Steam

Gravity Oil FUEL AMOUNT HEIGHT WATER LINE FROM FLOOR

CONNECTIONS— SUPPLY RETURN FEED WATER

PRESENT GAS: SIZE OF SERVICE 1½" SIZE OF METER

APPLIANCES #6 Rudd Heater & Range

BUILDING: CONSTRUCTION Brick Foundation-frame PROPOSED ADDITIONS

ROOF (STYLE AND MATERIAL) Slate

CHIMNEY Side – C.I. Thermostat is installed in hallway on 1st floor

REMARKS: Kitchen and maids room very hard to heat

(over)

Form Used in Pawtucket for Determining Boiler Size and Gas Characteristics

year producing data on which increasingly accurate computations could be made as to cost of gas for a proposed installation. The first twenty-seven installations were equipped with recording gas meters, and these are in use today, the data secured from their charts being carefully analyzed and studied. A year ago there were 51 homes heated with gas. Last season there were 120. The experimental work has been done, and the office of the Pawtucket company is a source of information on this subject that draws to it gas engineers and executives seeking data. The total send-out of gas for house heating was 35 million cubic feet through the past year. Even in July 35,000 cu. ft. were recorded. The average house owner in Pawtucket, who kept his coal furnace fired six months in the year is drawing gas during nine months with occasional automatic reactions to summer cold spells in the other three months. Mr. Hilton estimates that the total house-heating load is now about 7% of the total send-out, and that about 20% will be the economical maximum *under present conditions of operation*, but, when that point has been reached, it is entirely possible that new developments may entirely change the ratio.

This would place the present economical maximum number of installations at about 325, and the ultimate at about 1,000, in this city of about 65,000 population.

ATTITUDE OF GAS COMPANIES TOWARD OIL BURNERS

It is interesting to note that there are about 1,500 oil burners installed in Pawtucket, and of these about 1,200 use gas and electricity for pilots and motors. It is the policy of the gas company not to solicit heating business from the owner of an oil burner of the blast type, but to convert only the atmospheric installations. Pawtucket has, on the average, about 6,250 degree days, with a maximum variation of about 10%. With the present prices of fuels, coal at $17.00 a ton and gas at $0.75 per thosand, the average gas installation will show a fuel cost about 25% in excess of coal.

GAS HEATING COST DATA

In predetermining the cost of heating a home with gas, data are used based upon the analysis of past installations, and remarkably accurate predictions are made. A factor has been determined representing the amount of gas, in cubic feet, per average degree difference between inside and outside temperature, per square foot of theoretical radiation, per heating day. This factor is called K_H. In making the analysis to determine the value of this factor, it has been found that the effect of wind on the heating of a house is of greater importance than the difference between inside and outside temperature. The value of K_H, taken from fifty installations, is 0.174, and 0.175 is used in all calculations.

The lowest value obtained, in a home where the bedrooms are not heated, was 0.093, and the highest, in a case where it was actually necessary to cage in the thermostat to prevent constant "monkeying" was 0.245. In the application of this formula, a temperature difference of 35° F. has been found to represent an average inside temperature of 66°, over the entire 24 hours, and the average outside, over 200 heating days. The gas con-

STONE & WEBSTER MODIFIED 2-20-200 RULE

"2" - Measure single windows for their full area, add 10% if exposed to prevailing wind, and allow 1 sq. ft. of cast iron radiation for each 2 sq. ft. of equivalent window area. Make no allowance for weather stripping of windows. Consider single doors leading directly to the open as full window area. Skylights shall be considered as single windows and the actual glass area measured. For double or storm windows take only one-half the actual window area.

"20" - Determine the net exposed wall area (i. e., less single windows, single doors and the full area of the double windows), add 10% if exposed to prevailing wind and allow 1 sq. ft. of radiation for each 20 sq. ft. of equivalent exposed wall area. Where no attic space is between roof and ceiling, consider the ceiling as exposed wall. For "semi-exposed" areas, i. e., floors, ceilings, or partitions with an unheated, unused room (or attic) beyond, take one-half this area as the equivalent. Double doors, or doors leading to storm vestibules, shall be considered as wall space.

"200" - Determine the volume of the room (including closet space) and for each 200 cu. ft. of volume allow 1 sq. ft. of radiation.

General - Columns 1, 2, 3, 6, 7, 8, 12, 13, 14 and 17 are to be filled in on the job, as well as the information called for at the bottom of the sheet. The factors called for in columns 8 and 14 will be 1.0, 1.1 or .5; as explained above, and should be inserted on the job.

602 x 200 x .175 x 35° = 737450 = Total Consumption
Demand = 300 (475)
300 x 385 x 6 = # 175.00
Est. consumption cost = 370.00
Total operative cost = 545.00 - say # 600.00
Radiation used in selection of boiler = 935 ft²
Ideal #1-G-7 - 575.00 Radiation rating = 1050 ft²

USE THIS SPACE FOR NEEDED SKETCHES OR FURTHER EXPLANATION:-

Reverse of Form Shown on Opposite Page, Showing Calculations and Estimate

Typical Pawtucket Homes Heated by Gas. These Illustrations Prove That the Gas Boiler Can be Sold to the Owner of a Modest Home as Well as to a Leading Citizen.

sumption, and cost for the house figured on the typical sheet illustrated is:

$602 \times 200 \times 0.175 \times 35 = 737{,}450$, total consumption in cubic feet,

where 602 = total square feet of connected steam radiation,
200 = number of days in heating season,
0.175 = value of K_{rt},
35° = difference between inside and outside temperature.

The cost of this gas, on the two-part rate in force, would be $545.00, and the customer was told that this would be his probable annual bill, with a maximum of $600.00. As a matter of fact, this home has been maintained at 68° for the past heating season at a cost somewhat less than that figured, and almost exactly equal to the cost of coal heating during the previous season.

EFFICIENCY MAINTAINED BY FREQUENT FLUE-TEMPERATURE READINGS

It is the practice, in installing gas boilers, to cut a hole in the flue pipe about an inch in diameter, provided with a swing cover. Through this a thermometer may be inserted, and the temperature of the flue gas determined. Installations are frequently checked during the winter, and every effort is made to protect the customer against abuse of the equipment and consequent use of excess fuel.

Bryant, Ideal and Gallaher boilers are largely used in these installations, and some very interesting results have been secured with Rochester warm-air furnaces, in some instances nearly 90% efficiency being attained.

INSTALLATION PROVES SMALL HOUSE CAN BE ECONOMICALLY HEATED WITH GAS

There are several installations in Pawtucket that deserve individual mention, as they bring out, not averages, but possibilities. One of these is in a little "doll-house" owned by a man with an income probably less than that of the street-car conductor or motorman in his native city. Homes of this class are universally assumed to be beyond the reach of gas heating, which is only intended for a few of the wealthiest men in the community. How utterly this theory is refuted by this instance is shown by the comparative costs for heating this home with coal and with gas. There are four rooms and bath, with 165 sq. ft. of connected radiation, and a No. 240 Gallaher boiler. Formerly, an Ideal T-30-S had required 7 tons of coal costing $119.00 a season. The average gas consumed annually has been 198,800 cu. ft., costing $142.25. When the gas boiler was put in, the estimate of the probable cost of gas heat was $141.00. The initial cost of the gas boiler with thermostat was $375.00.

A three-story, ten-apartment building of frame construction had installed in it a No. 800-S Gallaher boiler and a No. 120 Gallaher gas-fired water heater, connected to a 100-gal. tank. After the gas boiler had been in service for some time, it was decided to convert that section of the basement that had previously been laid off for a coal-fired furnace and coal bin into another apartment, with the gas-fired boiler in its kitchen. This worked out perfectly, and the services of a contemplated janitor were eliminated. It was found that the balance of the basement could be converted into two other apartments, as the first floor of the building stood high above the ground. The rentals from these two apartments have more than paid the total cost of the fuel used in the building for the past season, practically a million feet. It is in cases like this that accurate comparisons between gas and coal become impossible.

The development of this house-heating load in the Stone & Webster properties in New England brought up so many new questions and was of such inter-company interest that, under the editorship of J. W. Howard, who was associated with the Woonsocket property, a little monthly sheet was started under the caption: "B. T. U. Fax." This served the purpose of a medium of intercommunication on gas heating, and lived a very useful life. Mr. Howard was later transferred to Pawtucket, where he is actively engaged in developing the industrial heating business, and functioning as president of the Industrial Gas Association of New England.

The attitude of the gas company toward the heating contractor is interesting. It would have been a logical proceeding for the gas company to carry out the installation of such gas boilers as it could sell. On the other hand, it was early determined by the gas company that such a policy would produce practically no revenue and antagonize the heating contractor. A meeting of the heating trade was called, the matter discussed, and the business of the gas company was defined as "selling gas." It was distinctly stated that the gas company desired that the sales and installation of such equipment be carried out by the trade, and to this end it was proposed by the company that the heating contractor sell and install the gas boiler, with a graded scale of discounts, according to the relative sales effort. By this arrangement the contractor is paid a commission for furnishing the name of a prospect where the actual sale is made by the gas company's representative. In this way a close co-operation is maintained, and the heating contractors of Pawtucket are keenly interested in selling gas boilers.

Next month the activities in the gas-heating field in other New England cities will be described.

Ten-Apartment House in Which Installation of Gas Boiler Released Space for Three Additional Apartments

Home-Study Heating Course
Lesson No. 10

(*Continued from Page* 62)

and one at the boiler. This double arrangement permits filling either at the top floor by watching the gauge-glass on the tank or at the boiler by using the altitude gauge as a guide.

Work Problem H-5-20

INSPECTION REPORTS

The student has now progressed to the point where he should be able to determine the cause of trouble with water heating systems that do not function properly and to make a report of how to apply correction methods. There will be presented, from time to time, examples of plants that demand an inspection and the application of remedial measures. The first such layout is shown in Fig. H-5-4. In this figure is shown a layout of an open tank, water heating apparatus, for a two-story residence and a garage located 40 ft. from the house. Apparatus was installed as shown but worked unsatisfactorily. Radiator K did not heat well. This was due to a short circuit, the water passing up through the risers to radiator J and returning into the return pipes so fast as to establish a reverse circulation in the end radiator. On the other run, radiator D did not heat, the hottest water was in its return pipe instead of being in the supply pipe. The student will make a report on the cause of the trouble and suggest two means for overcoming the difficulty.

Work Problem H-5-21

The next lesson, to appear next month, will be devoted to forced water heating systems, principles of operation and design of same.

Air Conditions During Sleeping Hours

How Night Temperatures and Humidities in a Boston Suite in January Compared with Similar Data for a Country Lodge in the Summer

By Paul W. Goldsbury, M. D.

IN SUMMER during the night, Nature seems to adjust atmospheric conditions in two principal ways which promote rest. The air has usually a lower temperature and is not so dry as during the day. The coolness and softness of the air is favorable to relaxation of body tissues and so promotes sleep. We recall the soft coolness of a July morning, especially with the dew on the grass, and of the growing warmth as the sun ascends. We are stimulated by the electric dryness of the midday hours but welcome the returning softness and coolness of the evening atmosphere. Perhaps we are more conscious of the daily flow and ebb of heat during the summer season than we are of the ebb and flow of the moisture condition of the atmosphere.

Air, as we know, when heated, expands and rises. The warmer the air gets, the more moisture or water vapor it absorbs and can hold. The nearer the ground, the heavier is the air and early in the morning, after a dew, the air at the surface is practically saturated with moisture. As the air is heated by the sun, it picks up the dew and absorbs moisture from lake, stream, foliage and vegetation, in fact, from every surface which can yield up or evaporate moisture.

The day air, taking up so much moisture, may hold absolutely more water vapor than night air, that is, have a higher absolute humidity, and still the former will feel dry when the latter seems damp and soft. The increasing capacity of warm air for vapor accounts for this. The cooling of the air at night diminishes its vapor-holding capacity and when the chilling goes below saturation point, vapor, of course, condenses and settles as dew.

INDOOR CONDITIONS IN WINTER AND SUMMER

In summer with windows all open, the atmosphere indoors as to temperature and moisture does not depart very far from that outdoors. How is it in winter or during seasons of closed windows? We require our buildings in January to be heated to a temperature which averages that of July. Now in our northern latitudes, Nature gives January a temperature which averages about 50° lower than that of July.

With that difference in temperature, the capacity of the January air would be only about one-eighth that of July, or, to put it another way, July air has an absolute humidity several times that of January. When we take air in winter at a temperature of 20° and heat it 50°, we increase its water vapor capacity eight times.

The problem of raising the temperature indoors is a very simple one as compared with that of giving such air ample vapor. Unless special vaporizing methods and agencies are used with artificial heating, the indoor atmosphere is very dry. One has only to test such air by the wet and dry-bulb thermometers to verify this. Often a difference of 20° will be registered between the two.

We find throughout the whole winter season, in fact, during that part of the year when windows are closed and artificial heating is used, that the moisture content of the heated air is low although the absolute humidity of the heated air is but little above the non-heated outdoors. Artificial heat is not allowed to die down during the night, so as to give, say, the contrast between night and day temperatures that we get in the summer months.

NO SURFACES TO YIELD MOISTURE, AS IN SUMMER

Indoors, where artificial heat is used for giving a July temperature, there are no surfaces yielding up moisture by evaporation, such as have been mentioned. If there is no special agency or evaporating media for softening and moistening the air, what is to prevent it from being dry, night as well as day? Such air must draw moisture wherever it can find it, from walls, woodwork, furniture, furnishings and from the delicate tissues of human occupants.

There may be little or no harm done by such dry air to the skin and membraneous linings of the human body for short periods of time. Dry air may seem to have a stimulating effect upon persons in offices, school and work rooms, as a contrast to the chill and dampness of the outside which those persons feel in coming and going thither.

ACTIVITIES OF THE DAY MAKE PEOPLE OBLIVIOUS TO UNWHOLESOME ENVIRONMENT

The various activities and employments of the day, of conscious hours, tend to make one insensible of many discomforts and hardships and of perhaps an unwholesome environment. During these daylight hours, there is a general drive and urge of business and social life and affairs which too often throw individual preference and feeling into the background. The hours of the night afford time for recreation, for relaxation, for privacy, for getting one's self together; mental and other reconstruction, and refreshment and quiet sleep must be had for the tired frame and anxious mind if the individual is to best maintain himself.

A room kept at a temperature during the day of 65° or above and having a relative humidity of 35% or less, that is, with the moisture content one-third of saturation, would provoke possibly few, if any, symptoms of distress. The lips might become a little parched and there might be a little nasal irritation. But there are so many movements of the body, plays of muscles about the head and face and the use of the voice is such that these seem to counteract the little irritations to the skin and mucous membranes caused by dry air.

At night during sleep there are no such voluntary and counteracting little movements. The voluntary muscles about the face, as elsewhere, are in a passive state and ordinarily more or less relaxed. The air about the bed, even if not as dry as that above referred to, would irritate the membrane of the nose and perhaps cause swelling and thickening enough to interfere with free breathing through its normal channel. The mouth would thus be opened in order to get more room for the passage of air and thus lips, mouth and throat would be affected by the dry air and become parched and irritable.

A hot current of air pouring into a sleeping chamber from an open register or hall door often makes these symptoms of distress very marked, so that throat and mouth feel stiff and raw. The effect of this parching air upon the skin is not as obvious as upon the mucous surfaces of nose, throat and mouth, but it is far from soothing to nerves at a time when wholesome sleep demands a reduction of whatever may be irritating.

LOW HUMIDITY OF INDOOR AIR LONG CONTINUED IN WINTER TIME

The average of our winter indoor relative humidity as we have seen, will compare with the relative humidity of the driest midday hours of summer days. There are summer days in northern latitudes where the relative humidity will register below 30%, but not for long and such days are preceded and followed by night hours where the relative humidity may be anywhere from 50% to 100%.

Take, for example, a summer day where at 2 P. M. the thermometer registers 94° and the relative humidity is a little under 30% of saturation. The temperature would only have to fall about 10° (which is about the minimum daily temperature variation) to bring the relative humidity up to 50% of saturation.

If on such a day the temperature should fall 20°, which is about the average of daily variations, the air would be about four-fifths saturated with vapor and would have a relative humidity of 80%. This is a theoretical estimate but serves for practical purposes.

As the heated summer air contains so great a quantity of vapor in suspension and so much moisture is accessible, low relative humidity is a matter of but a few hours and, with lowering of temperature, that percentage rises. The dryness of a few hours, followed by a softer atmosphere, does not put the skin or delicate membranes to undue tension. It is another matter to subject them for long hours to the pulling of moisture from them by an air of such a temperature that it is in fact very greedy for moisture wherever it can abstract the same.

ATMOSPHERIC CONDITIONS IN A BOSTON APARTMENT DURING JANUARY

For the past few years the writer has been making a study of temperatures and relative humidities at the rising hour to determine something of the quality of air about his pillow during the hours of sleep. Considering the fact that the temperature on retiring would probably be substantially higher than that during the hours following midnight, he thought an early morning reading of these might give a fair average of both temperature and humidity for the night as a whole.

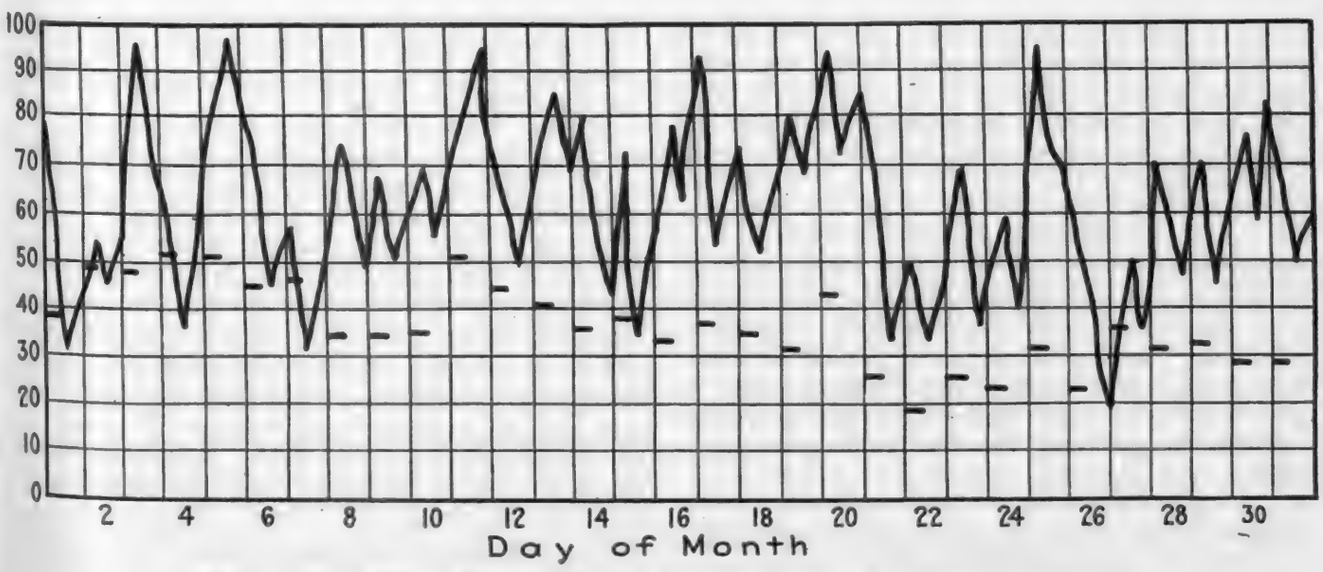


Fig. 1. Early Winter Morning Relative Humidity Readings in a Boston Apartment

Continuous Line Shows Outdoor Relative Humidity Variations During Same Month.

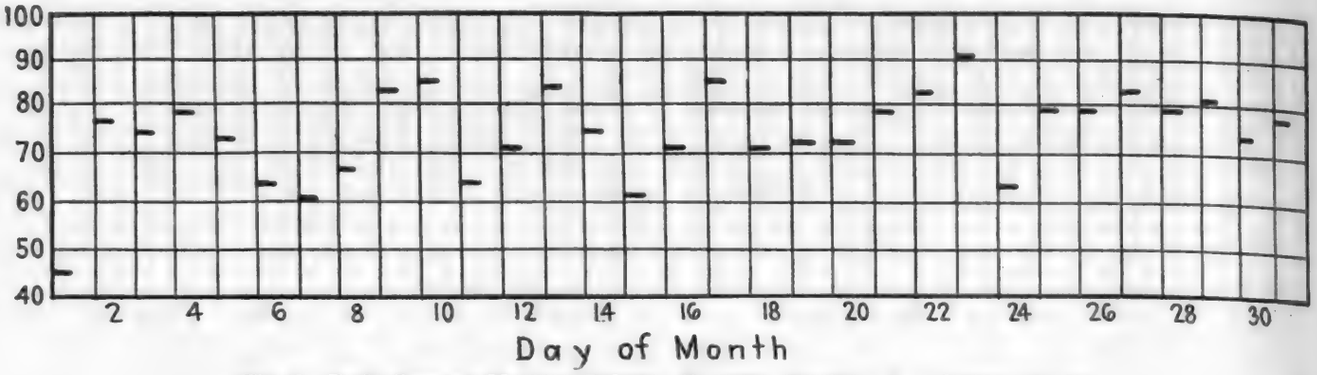


Fig. 2. Early Summer Morning Relative Humidity Readings in a Country Lodge

The first chart (Fig. 1) shows the early morning relative humidity readings in a Boston suite, indicated by dashes for a typical winter period. The average of these readings is about 38%. This apartment had two rooms, kitchenette and a bath and was shared with two other persons. The heat was turned off from one room and sometimes both. The writer occupied a room facing the street and these windows were more or less freely opened.

Attempt was made whenever possible to keep open the window in kitchenette, the window open into the other chamber which opened on air court, and all doors open, in order to get thorough ventilation. Of course, there was always more or less of a handicap in getting the other occupants to accept a program without some modifications, due to weather variations, etc. The beds were so placed as to be out of drafts.

If the writer had been able to place the head of his bed nearer the windows, an improved reading, lower temperature and higher relative humidity, would undoubtedly have been obtained. It must be remembered that the continued upkeep of heat in the hall and whatever heat there was in suites about this tended to sustain heat here in spite of efforts to reduce such. In short, the humidity readings are the best the writer could obtain in a situation where he could not have things as he would plan.

The continuous line in same chart shows the range of relative humidity readings outdoors from government records. We find there were daily ranges of relative humidity from about 10% up to 60%, that the average for month, night and day outdoor readings approached 70%, and that on less than one-third of the days did the lowest outdoor reading go below the highest obtained in the suite.

To sum up, while the writer was occupying a suite in which the range of temperature ran from 90° down to 50° or 55° and the relative humidity from 12% up to 52% (extremes for the month, not the day) with artificial heating and ventilation, Nature outdoors showed a temperature range of from 50° down to 10° below zero and a relative humidity range from 19% (extremely low) up to 100%.

SUMMER TEMPERATURE AND HUMIDITY READINGS IN A COUNTRY LODGE

Contrast this chart of humidities taken through the month of January in a Boston suite with those taken in a small lodge where the writer spent the summer, six months later (Fig. 2). This building was fixed up by him a number of years ago in a way to obtain free and thorough ventilation. It is set about 100 ft. back of a farm house, is well shaded during the heat of the day by an ample maple tree directly south of it. The building is about 10 x 14 ft., has windows on each side and a door, all of which are screened. It is set about a foot above the ground, standing on posts, and never seems damp except as windows are open and it gets damp outside. The windows are never closed during the warm months except to keep out a driving rain or on the windward side during a severe wind. The land on the northeast and west sides slopes gently away from this building and there are no trees or other obstructions to free ventilation.

This place lies somewhat in a valley, so early morning mists are not uncommon with often a registering of 100% relative humidity just outside of this lodge. This dampness rarely penetrates the building.

Temperatures here inside the building averaged 2½° higher in the early morning than those outside. The relative humidities average 8% lower in the morning and about that much higher at midday. The relative humidities averaged about 74% for the month (about double that obtained in the unwieldy suite) and the air condition was certainly conducive to restful sleep.

An outdoor sleeping chamber can be arranged to approximate very satisfactorily Nature's arrangement of temperature and moisture. With the head of the bed between open windows (avoiding, of course, strong drafts) and a practical reduction of heat in the rest of the sleeping chamber, very satisfactory air conditions for sleeping hours are often obtained. Any improvement in lowering unnecessary moisture abstraction from body tissues during sleeping hours means, of course, increasing the value of such rest. The human frame seems to respond to tonic flows and ebbs of heat and ebbs and flows of relative humidity. These harmonic rhythms of change seem to be necessary to the promotion of the best service from all its functions and activities.

British Fuel Research Board Reports on Heating of Rooms

IT is well known that a human body kept warm by radiant heat and breathing fairly cold air is in the best position to do its work and make its possessor comfortable. This, of course, is a condition by no means easy to attain, especially in large rooms, and heating on an extensive scale is virtually bound to make use of air that is prewarmed or is made to convey heat by convection, at least as an auxiliary to the source of radiant heat.

In a very interesting and informative report, recently published by the British Fuel Research Board on "The Heating of Rooms," Dr. Margaret Fishenden describes experiments made to determine the cost of attaining comfortable conditions from various sources of heat. Dr. Fishenden's report commences with a fairly full account of the physiological circumstances under which people are warmed and the heat they require according to their occupation for the time being. The balance between heat intake and output has been verified by a number of observers, and, while certain discrepancies are apparent in different sets of experiments, they are not remarkably large. At the same time, having regard for the fact that the purpose of heating is to produce comfort, and that comfort is not necessarily gauged by the temperature of the surface of the skin, Dr. Fishenden has endeavored to ascertain the qualities of heat required for comfort and to express the cost of heating by various means in terms of those quantities.

The observations necessary for this purpose were carried out in a room of nearly 4,000 cu. ft. volume, 14½ ft. high, 17½ ft. long, and 15½ ft. wide, the walls being lined with glazed bricks to a height of 4 ft. and above this level made of brickwork colorwashed. A chimney flue ran from a hearth recess. The room was so situated that it received no direct sunlight.

The sources of artificial heat for air heating were either four cast-iron sectional radiators controlled by electric immersion heaters, or 20 luminous batswing burners arranged round the room about 6 in. from the floor. Radiation was produced either by a gas fire under the flue; a high-temperature open-wire electric heater, with vertical elements in a reflecting case, arranged to be used at any height and angle; or a special low-temperature (up to 750° F.) gas heater of about 6 sq. ft. area, consisting of a shallow sheet-iron box with asbestos back and baffled interior, heated internally by a series of Bunsen flames playing on refractory material and almost filling the hearth opening. The ventilation was varied when desired by lighting a gas ring in the chimney a little above the throat, and experimental drafts of varying velocities were produced, when required, by electric fans.

Measurements were made of air and wall temperatures, the velocity of drafts, the heat absorbed at various points, and the rate of fall of temperature of bodies at or near blood heat. One man and one woman of specified height and weight observed the relation of various heating arrangements to comfort, by sitting in the room for specified periods reading and writing and from time to time noting their feelings.

So far as other results are available, they appear to be in fair agreement with these subjective observations. The warming effect of sources of radiant heat varies, of course, with the position of the subject, and the grading of the temperatures as to comfort fell, therefore, into zones, which were plotted out for various air temperatures. The variation of ventilation was from 1 to 4½ changes of air per hour. The calculations of cost, however, appear to have been made on the assumption of one change per hour.

In estimating the costs, a distinction has been made between heating, mainly by radiation, such as is obtained with an open fire or a gas or electric fire, and by convection, such as by radiators. With radiation the zones of comfort will accommodate only a limited number of persons, and will vary in extent with the amount of radiated energy. The amount of heat energy required for comfort will therefore increase with the number of occupants, and by much more than they contribute through their own evolution of heat. With convection heating, on the other hand, the temperature throughout the room is far more uniform, and the heat contributed by each person causes the required energy to decrease with the number of occupants.

Calculations are made in the report for the various methods severally. For continuous heating by radiation the cheapest method is to burn low-temperature coke in an open fire, coal being slightly more costly, gas heaters about two and a half times as dear, and electric heaters about five and a half times, the cost of the fuel or current being taken at 45s. (approximately $11.25) and 50s. (approximately $12.50) per ton for coke and coal respectively, gas at 10d. (20 cents) per therm (therm = 100,000 B.T.U.) and electricity at 1d. (two cents) per unit. Consequently, if the room is used only for one-fourth of the day, and allowance is not made for the banking of fires when the room is vacant and loss of heat from the walls when gas or electricity is cut off, the cost of heating by gas becomes about one-half, and by electricity about one and a quarter times the cost of a fire. For continuous air heating the cost of gas is about two and a half times that of coke, and of electricity about seven and a half times, and the reduction for intermittent heating still leaves the cost of gas and electricity materially higher than that of coal. No figures are given for the radiation effect of the low-temperature gas heater.

The size of the experimental room, and especially its height, would seem to raise questions that may require further investigation. In particular it is not clear whether the calculation for rooms of smaller size makes allowance for the indirect radiation from the walls, floor, and ceiling that is an essential factor in the comfort of this method.

A. C. BLACKALL.

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

MEMBER
National Publishers' Association
Associated Business Papers, Inc.
Audit Bureau of Circulations
National Trade Extension Bureau

VOL. 22 August, 1925 No. 8

Published Monthly at New York, N. Y., by the
HEATING AND VENTILATING MAGAZINE COMPANY
A. S. ARMAGNAC . . . . . President and Editor
GUSTAVE PETERSEN . Treasurer and Business Manager
P. E. FANSLER, ... Associate Editor
A. M. DANIELS, ... Contributing Editor

Executive and Editorial Offices . . 1123 Broadway, New York

Western Office . . . . . 105 So. Dearborn St., Chicago
CLIFF W. PRESDEE, Manager

European Representative
W. G. Hollinworth, 38, Victoria St., London, S.W.

Subscription	$2.00 per year
Canada	2.50 per year
Foreign Countries	3.00 per year
Back Numbers	25 cents each

IN the fullness of time we have come to this situation in the various movements for better heating and ventilation standards:

1. Some twelve or more States have compulsory ventilation laws on their statute books which are quite generally characterized as out-of-date, to say the least. They represent a period that is past. As one writer expresses it, "the best authorities have now discarded the old theories of ventilation and agree that temperature, motion, moisture and removal of odors are the four important elements."

2. The heating engineers' society, after four years of effort in compiling what was designed originally to be a code, has christened the results of its labors "The A. S. H. & V. E. Compendium of Modern Practice" and has released it for publication.

3. The heating contractors' association has issued its "Engineering Standards," with estimating tables for some sixteen leading American cities and has linked up the "Standards" with the "Certified Heating" movement in such a way as to make them the basis for all heating guarantees offered by heating contractors.

4. Wisconsin has adopted a State code on heating and ventilation which, by all odds, is the most intelligent and comprehensive statute of its kind now in effect.

It would seem as if confusion had been worse confounded by this multiplicity of disconnected efforts in which correlation has been conspicuous by its absence. It is no small relief, therefore, to see light shed on the situation suggesting a way of harmonizing the various efforts, all aimed towards standard practice in heating and ventilating engineering. We refer to Mr. Lewis's analysis of the situation, in this issue; we might add that while the analysis is his, the suggestion we are about to offer is ours for which we are prepared to assume full responsibility.

Mr. Lewis cuts the Gordian knot by classifying the A. S. H. & V. E. code as not a code at all, but simply a compilation of rules and methods which may be taken and used by all interested for what they are worth. This leaves the way clear for united action on the most pressing matter now before the heating and ventilating industry and THE HEATING AND VENTILATING MAGAZINE'S suggestion is for the industry and profession to get behind the Wisconsin Code and use it as a *model* for adoption in other States, especially those now burdened with old, obsolete ventilation laws.

THE full text of the revised Wisconsin Code has now been published in THE HEATING AND VENTILATING MAGAZINE, together with the story of its original compilation and revision. In its compilation it enlisted the earnest co-operation of many leading heating and ventilating engineers. The operation of the code, on the testimony of the Wisconsin Industrial Commission, is "very satisfactory," while "the requirements meet with the general approval of designers and the public, as indicated by the nature of the plans which are submitted for approval and the installation of heating and ventilation plants installed." From other sources we hear good things spoken of the code by those whom it most directly affects. One architect writes: "As now finally revised the code is in workable shape and with intelligent interpretation by the industrial commission, can be used to great advantage in the designing of heating and ventilating systems throughout the State." Another says: "We are ready to be guided by such regulations as are enforced; in fact, as a general thing they are of assistance, rather than a detriment."

The Wisconsin Code has passed through all the vicissitudes of legislative tribulations. It is a going proposition. It can readily be modified to fit the necessities of other States. If it has any faults they will be disclosed in due course and ample means are provided in the code itself for rectifying them.

The only thing the code lacks is the official endorsement of the heating and ventilating industry. Given that, the way will be open for all States having antiquated statutes on heating and ventilation to swing into line with something that is up-to-date, practical and effective.

Codes, Rules and Compendiums

Distinctions to Be Made Between the A. S. H. & V. E. "Compendium of Modern Practice," the Steamfitters' Rules and the Wisconsin Code

By Samuel R. Lewis

A CODE is supposed to be a collection of rules. It may mean a State or municipal law, or it may mean a formula for personal conduct, or it may mean a collection of engineering tenets. The word, in fact, is a wonderful and satisfying thing, for it can mean 'most anything one wishes to express, and can be understood as conveying 'most anything the context implies. It really does not have to be a collection, nor does it have to be written.

A question was asked me: "What, in your judgment, is the relation between the American Society of Heating and Ventilating Engineers' code, the Chicago Masters Steamfitters' code, and the Wisconsin Industrial Commission code?" The impression of the questioner was that they all contained standards, that they did not agree, and that not one harmonized with the others.

I answer that the first is a text book for erudite engineers, probably never to be completed, probably never to be adopted, but very valuable as a means of assembling data as to good practice and for showing up the appalling ignorance of most of us.

The second is a trade rule, admirable for its limited purpose, and likely to continue in heavy use because of its simplicity. It is especially valuable because the machinery for revising it is kept oiled and running.

The third is a rule of the happily and remarkably non-political Wisconsin Industrial Commission, built to meet conditions as they have been found to exist, and is commendable in that its machinery for revision and adaption is always warmed up and ready.

CODES DO NOT CONFLICT

I do not think that the three so-called codes conflict at all. They supplement one another. Each is well fitted for its own purpose. Each is so different from the others in its purpose and conception that we realize the unfortunate restrictions of language which calls them all "codes." The American Society of Heating and Ventilating Engineers' effort is a text book; the Steamfitters' schedule is an assembly of working rules; the Wisconsin enactment is more nearly what is popularly believed to be a code.

The American Society of Heating and Ventilating Engineers has almost always had a committee on legislation for compulsory ventilation. Nearly every meeting witnessed a report of progress, or the presentation of some sort of outline for a compulsory ventilation law. No one ever worked unduly hard at it unless it appeared that some State or community was about to enter a bill or pass an ordinance, when the local members would get busy. These local organizations or groups usually found the code literature in the Transactions of the society of value, for it was a digest of what had been done elsewhere, and in most cases covered a short requirement for air volume, heat removal and moisture control.

The present American Society of Heating and Ventilating Engineers' code developed under Mr. Harding's able leadership, and just now accepted and ordered printed, but *not* adopted by the society, can be called a code, but ought to be called a text book. It is intended eventually to cover the entire range of human endeavor as to heating and ventilation. It is a collection of data exceedingly valuable to the members of the society in designing heating and ventilating installations, and the society is to be congratulated that finally, after many months of work, it is to be made public.

It is to be hoped that everyone will read it and use it and correct it and improve it and sweeten it, and that each will tell the society about all the mistakes he has discovered and the improvements he suggests.

Great credit is due Mr. Harding, chairman of the committee which prepared the code, for the generous way in which he has stood by his guns, holding his temper, weighing fairly every criticism, during the long drawn-out bombardment of the proposed code.

This is too good a chance to let slip by, to emphasize Dean Anderson's quotation from the Kentucky horseman, J. E. Madden:

"No complaints considered unless accompanied by a remedy."

The more you think about this, the better it gets. Too many of the criticisms of the proposed code had no suggestions as to remedy.

The American Society of Heating and Ventilating Engineers' code is valuable to drafters of laws and ordinances as a reference work for standards, even though it does not tell a good many things it ought to tell.

Many of us truly had no idea how many things there were we ought to require which we could not require because we did not know what they were.

No, don't try to edit this. I mean it.

Please, someone, tell us, and make us believe you know what you are telling, how, for instance, to pick out assuredly the best-size boiler, using manufacturers' ratings.

Tell us how much air per person per minute we should design our ventilating plant to deliver.

The Chicago Master Steamfitters' code lays no claim to being highbrow or altruistic. It was designed intentionally for its members only, and was

developed especially for the members who have graduated or are graduating from pipe tongs and overalls. It is enforced with sledgehammer efficiency. It is in many ways based on rules of thumb, and its engineering requirements are such as would be expected to reach the proprietors of the little new shops effectively, while not materially being out of step with the more elaborately-engineered shops. The best thing about this code is that he who fails to comply with it may very effectively be put out of business.

Its enforcement has resulted in a very great improvement in the quality of the work done in Chicago, and the vigorous and concise terminology of this code makes it very effective. It has been found necessary to keep it in a fluid state, constantly in revision, especially as to boiler ratings.

One gets an impression, in passing, that any code, to be of much use, must be flexible, easily modified, constantly revised.

The Wisconsin Code was developed during many meetings by an unpaid committee which gave rather remarkable co-operation. It was revised and rewritten many times. It does not pretend to be a text book. It has been cut nearly to half of its erstwhile size. It seems to have been developed especially for small town or country schools, and was extended then to cover other buildings. It lays no claim to anything new in engineering, but frankly appropriates what seems reasonable from every source available. It is, however, original, or unconventional, in many particulars, especially in its definitions and in the quantity provisions based directly on the floor area instead of indirectly, as in former rules, on the number of occupants. It is full of valuable little notes or explanations, not proper to a statute, perhaps, and not an obligatory part of the code, but of great help as suggestions to the reader and indicative of some red-blooded humanity in the drafters.

This code was developed always with the idea of practicability, to meet and to answer requirements which had been discovered by the State officers who participated in the preparation of the code.

The Wisconsin Code is perhaps especially interesting, because it was written with this angle in view. Its enforcement lies with the Industrial Commission, which has great power and discretion.

They claim in Wisconsin that the liberal, non-political, very public-spirited and thoroughly honest administration which called for this code was due very largely to the service given back long before the war by Bob LaFollette, and we can forgive the mistakes this great man seems to have made in later years, in the light of the very genuine services he undoubtedly rendered Wisconsin and the Nation.

Trade Abuses in Need of Correction

A CLEAR-CUT summary of certain trade abuses in need of correction is contained in the following resolution which was submitted at the recent convention of the National Association of Master Plumbers by the Kansas City (Mo.) delegation and adopted by the convention:

Whereas the manufacturer, the wholesaler and the retail dealer are recognized by our federal, State and city governments as legitimate classifications of business through which raw products are assembled, manufactured, distributed and installed to the consuming public, and

Whereas through many years of practice these three groups have demonstrated their value and necessity to the body public, not only in our industries, but in all others of similar nature, and

Whereas in matter pertaining to rules and ethics governing these three distinct groups, practice has proven that the government, the public, the manufacturer, the wholesaler and the retailer are best and most economically served when these rules and ethics are strictly conformed to, and

Whereas in recent years, during and since the World War, the conditions governing the distribution of plumbing and heating material have become unsettled through and because many wholesalers and manufacturers have not conformed strictly to these rules and ethics of good business principles.

First: He, the wholesaler, in many instances has sold direct to the customers of the retailer and contractor.

Second: He has conformed to these rules and ethics governing the wholesaler in the city where he is located, but has sold direct to the public in the country districts.

Third: He has left his sphere as a wholesaler and entered the retail and contracting business by lending to them his moral and financial aid by supplying estimating services thereby increasing cost of service generally to the public.

Fourth: He has sold to owners, builders and speculators, and to cover his selling plan necessitates an increased charge to cover his selling force at a detriment to the public.

Fifth: He has used the scheme of blanketing or optioning orders to give a differential to a dealer far beyond that called for by the actual buying power of that dealer which is proving expensive and costly to reliable dealers and the public.

Sixth: He has advised and abetted dealers to enter into and undertake work far beyond their capacity, that he, the wholesaler, might increase his sales and get a hold on the dealer or contractor.

Seventh: He has through these irregular and unethical methods of selling and distribution increased materially the overhead operating costs of the wholesaler and the dealer, and likewise increased the cost to the public at large.

Therefore, Be It Resolved, that this, the National Association of Master Plumbers in its forty-third annual convention assembled, do go on record as condemning such practices.

And Be It Further Resolved, that they solicit the assistance of all manufacturers and such wholesalers and the public as now conform to the rules and ethics governing the distribution of plumbing and heating material to aid us in restoring to universal use such rules and ethics as are beneficial to the public and our industries and standardization.

Takes Stand Against Free Engineering

FREE engineering is condemned in unmeasured terms in a report presented to the Western Society of Engineers at its recent annual meeting, and which has been endorsed by the directors of the Chicago Section, American Institute of Architects and the Illinois Society of Architects.

The basis of the investigation was a memorandum received by the board of directors of the society which read:

"It is now possible for the architect or owner to have (free?) engineering designs prepared by the contractor or organizations furnishing material or equipment, as follows:

"STRUCTURAL DESIGNS by the bar companies and structural steel fabricators;

"HEATING DESIGNS by the contractor or manufacturer of heating specialties;

"VENTILATING DESIGNS by the contractor or manufacturer of ventilating equipment.

"ELECTRICAL DESIGNS by the contractor, manufacturer of electrical equipment or by the public service corporation furnishing current;

"PLUMBING DESIGNS by the plumber.

Similar conditions exist in connection with nearly all equipment and material required.

"Even when engineers in private practice furnish the designs, it is occasional practice for the architect to avoid paying engineering fees on their work by specifying that the contractor shall pay most if not all, of the engineers' fee under the guise of 'Shop Details,' 'Construction Details,' or 'for checking Shop Details.'

"In the case of a large building recently constructed in Chicago it has been reported that the structural design was paid for by the contractor furnishing and placing the forms.

"It is not the purpose of this memorandum to enter into a discussion of the propriety or impropriety of such practice but it is felt that if such method is proper from the standpoint of efficiency and economy, it should be done in the open, so that the owner will know what and who he is paying for engineering services."

THE COMMITTEE'S REPORT

In its report the committee, which is headed by H. J. Burt, chairman, speaks of certain complaints which have been made to the officers of the society relating to certain practices by engineers, architects, contractors and manufacturers under which, it is claimed, injustice has been done to professional engineers and the public.

Among the specific practices complained of, the committee states, are the following:

A mechanical engineer objects to the practice of a manufacturing concern that manufactures and installs heating equipment under plans prepared by the manufacturing concern without specific remuneration for the engineering work involved.

A mechanical engineer complains that contractors for piping in buildings offer to prepare plans for such piping, with no specific remuneration therefor, except the prospect of being awarded the contract.

A contractor complains that certain building contractors offer to build buildings from their own architectural drawings, without specific remuneration for the architectural services.

In its discussion of these and other complaints the committee points out the fact that the Western Society of Engineers includes in its membership engineers and architects in general practice, a large number of very capable engineers employed by public and private corporations, as well as engineers operating as contractors and manufacturers. The report then goes on to discuss the development of certain engineering specialties as having a bearing upon the matters under consideration. For instance, mention is made of the development of the steam pump, first largely used in this country in water works systems, and the fact is pointed out that the first machines for this purpose were conceived, designed, built and installed by manufacturers, who found it necessary also to design and build the pipe systems and appurtenant works necessary for the utilization of the pump, as there were no engineers in general practice familiar with the subject. Thus the practicability of steam pumps in general system of municipal water works was demonstrated.

"In the course of time," the report continues, "many technical men became expert in the application of pumping equipment, and the design of the appurtenances necessary for water supply. As knowledge upon this subject became more general, the manufacturer found plenty to do in the manufacture of his pumps and various other devices in the projects gravitated to certain other manufacturers. At the present time practically all the designs are made by consulting engineers, or by engineers and operating officers in the employ of municipalities and corporations, and the larger part of such equipment is purchased on plans and specifications."

The report discusses in a similar way the development of the mechanical filter for the purification of water, as well as the use of reinforced concrete. Structural steel, comments the report, has had a similar history.

"The contract is unfair," states the report, "and not in the interest of the public, where a builder or others prepares a design and subsequently becomes a bidder in competition with other contractors under his own design. This practice should be discouraged. Under any circumstances, success in carrying out work in which the constructor designs, depends upon the ability and integrity of the contractor. Such work should be carried out under a form of contract, through which the contractor has every incentive to do good work with a proper regard for economy."

THE COMMITTEE'S CONCLUSIONS

The committee's conclusions are as follows:

(1) Engineers, architects, manufacturers and contractors should co-operate, in so far as possible, to eliminate objectionable practices, whereby unfair advantage is obtained on the part of one at the expense of the other, or where the buyer may be imposed upon.

It is perfectly evident that there is no such thing as free engineering. There must be a sufficient remuneration. It is in the interest of all that this remuneration should be fair and open. An exorbitant remuneration should not be concealed in the price of the article or device.

(2) It is recognized that new contributions to advancement in the useful arts must pass through a stage in which the designer builds and takes full responsibility. If the contribution is a real advancement, knowledge regarding it will ultimately be widely disseminated, after which it will be designed by purchaser's agents. With a widely-expanding field, this is accepted as inevitable by the manufacturer. In many cases it is welcome. This condition comes about through evolution, it cannot be influenced to any large extent by rules and regulations on the part of practitioners.

(3) The business of manufacture and sale of machinery and complicated equipment cannot be conducted to-day without an engineering force, expert in the application of the equipment. No consulting engineer or architect should fail to advise himself regarding available equipment by consultation with the manufacturer's experts. There is no other way to apply correctly the best devices to the required service. However, no self-respecting engineer or architect will secure from a manufacturer the design of a structure, or a part of it, under an implication that a purchase will be made from the manufacturer, and then turn over to the client the result of this work as his own. This is bad ethics and bad morals.

(4) This committee recommends no legislation and no rules on this subject. It is suggested that this report, or such part of it as may seem useful, be published in the *Journal* of the society.

Wisconsin's Revised Heating and Ventilation Code

Full Text of the Latest State Law Covering Standards for Heating and Ventilation of Public Buildings and Places of Employment

(Adopted April 8, 1925)

(Concluded from July issue)

SECTION 5. HEATING AND VENTILATING EQUIPMENT

Order 5860—Fresh Air Intakes.

1. Location. Fresh-air intakes for all gravity heating systems and all gravity ventilation systems shall be located on the side, or sides, of the building exposed to the prevailing winds.

2. Height Above Grade. All fresh-air intakes hereunder shall be above the finished grade, not less than 2 ft. for gravity systems, or 6 ft. for mechanical systems, and shall preferably be in a side wall and below the roof of the building.

3. Screens. Fresh-air intakes shall be suitably screened against admission of birds, leaves and other foreign materials.

4. Weather Protection. All fresh-air intakes shall be suitably protected against weather and water.

5. Accessibility and Cleanliness. All fresh-air intakes shall be made and maintained easily accessible for cleaning, and shall be kept clean and sanitary in use throughout the circuit to the heater.

6. Size of Opening for Intakes. There shall be not less than 1 sq. ft. of net free area in fresh-air intakes, for each:

(A) 300 cu. ft. per minute of air supply to be provided by gravity ventilation systems; or

(B) 1000 cu. ft. per minute of air supply to be provided by mechanical ventilation systems.

7. Wood Intake Ducts Metal Lined. Fresh-air intake ducts constructed of wood, or similar material shall be tightly lined throughout on inside with sheet metal.

Order 5861—Air Purification Apparatus.

1. General. The construction, design and control of all air purification apparatus shall be such as to insure consistent maintenance and operation.

2. No Dirty Spray Water. Dirty water shall not be recirculated through sprays affecting air used for ventilation purposes, and not less than 20% of air washer water used shall be renewed during each day of operation exclusive of make-up water; and the water reservoir shall be emptied and thoroughly cleaned and refilled with fresh water after each week of operation.

Order 5862—Heaters.

1. Arrangement. Where more than one heater is required, or provided, for service to the same piping or duct system, or group of systems, they shall be set in battery form and shall be cross-connected so that any one may be used alone or any combination of them may be used simultaneously.

Order 5863—Boilers.

1. General. The construction, equipment, connections, etc., of all boilers installed hereunder shall comply in every way with the Boiler Code issued by the Industrial Commission.

2. Auxiliary Water Supply. Where the heating system condensate is returned to the boiler as feed water, there shall be an auxiliary supply of water to the boiler, preferably from the community water supply system, capable of furnishing continuously at least 50% more water than is circulated in the system.

3. Valves Required. Every such heating system shall have stop valves on the system supply and return mains. If a safety loop is provided, all valves shall be outside of such loop. There shall be a stop valve and a check valve on the auxiliary water supply pipe, with stop valve between the check valve and the boiler return header. All such heating systems shall be provided with adequate air valves.

4. Mechanical Returns. In every heating system in which a mechanical device is used for returning condensate to the boiler, and which is so designed that condensate may return by gravity, the mechanical return device shall be by-passed with valves so that it can be removed or repaired, if necessary.

Order 5864—Furnaces.

1. Location. All furnaces shall be located so that the air supply circuits leading to and from them will be as short and direct as practicable; where fans are used with furnaces, but the furnaces shall be located in the discharge circuits of the fans.

2. Gravity Systems, Fresh Air Below Grate Level. In gravity systems, the fresh air inlets to furnace air-ways shall be such as will insure distribution of fresh air to relatively unheated portions of the furnace proper and throughout the furnace air-ways; the top of such inlets shall not be higher than 2 in. below the top of the grates.

Order 5865—Jacketed Stoves.

1. Where Permitted. The installation of jacketed stoves shall be considered permissible for schools having not more than two class rooms; also for portable schools and for other occupied areas having a gross floor area not greater than 1000 sq. ft. and for temporary installations elsewhere provided written permission is granted by the Industrial Commission.

NOTE: Jacketed stoves are best suited for areas of sparse occupancy, such as in many standard-size schoolrooms having only a few pupils in attendance. Such installations are intended to recirculate about 75% of the air handled thereby and are thus not suitable for occupied areas having more than a few people present, unless the percentage of recirculation is proportionately reduced. Jacketed-heater installations should generally be avoided where a cold basement occurs under the room to be served.

2. Location. All jacketed stoves shall be located in northwest portions of the principal rooms to be served thereby, unless the local weather conditions are unusually peculiar and are so stated to the Industrial Commission, and shall be well clear of all walls, alcoves, or other obstructions to the free and rapid distribution of heat and circulation of air in the room.

3. Setting, Dimensions. The casings, shields, or jackets, of jacketed stoves shall be set according to the following limiting dimensions:

(A) Not less than 6 in. nor more than 10 in. clear of the stove proper;

(B) Not less than 8 in. nor more than 12 in. clear above the room floor, except at intake;

(C) Shall extend up to levels not lower than the highest parts of such stoves;

(D) Shall be not less than 12 in. clear of the nearest walls and not less than 3 ft. from the nearest intersecting walls.

4. Setting, Construction. The casings, shields, or jackets of jacketed stoves shall be appropriately constructed double, with not less than ¼ in. air cell, or horizontally interrupted air spaces intervening, and shall shield adjacent occupants from undue radiant heat and unequal distribution of heat.

5. Fresh Air Intake Required. At least one fresh-air intake shall be provided, maintained and operated for each

jacketed stove installed, and such intake shall be adequately shown on plans submitted for approval, and shall include:

(A) Ample elbow outside the building wall with screened opening turned down, or other equivalent weather protection.

(B) Appropriate direct connecting duct near the floor of room served, having a net inside area of not less than 4 sq. in. per square foot of floor area.

(C) The intake duct shall be joined to the heater casing and air-way in a manner to prevent cold air from spreading over the floor, and to insure proper and adequate contact of fresh air with heater surfaces.

6. Outlets. Gravity outlet openings in rooms served by jacketed stoves shall be located at floorline not less than 7 ft. clear of stove casings, and shall have net free areas not less than 44 sq. in. per square foot of floor area.

7. Smoke Flues and Outlet Flues Combined. Where suitable and effective devices are used for mixing of smoke and foul air in conjunction with jacketed stoves the smoke flue and outlet duct may be combined provided the net free area of combined flue is not less than the sum of the required outlet duct and smoke flue areas.

Order 5866—Stack Heaters.

1. Minimum Grate Area. The grate areas of stack heaters shall be not less than 30 sq. in. for each 1000 cu. ft. per minute air supply required for the rooms served, and in no case may be less than 50 sq. in.

2. Location in Flue. Stack heaters shall be located so that the vertical center-lines of heaters and flues will coincide, wherever possible.

3. Diaphragm Required. Where a single stack heater serves two or more vent circuits, the circuits shall be kept separate up to a point not less than 4 ft. above the stack heater, such as by a tight diaphragm.

4. Accessibility. Stack heaters shall be arranged conveniently accessible from furnace firing space.

Order 5867—Chimneys.

1. Height and Effective Area. Chimneys and smoke flues shall be of ample effective area and height for the calculated maximum duty, and shall include sufficient additional height to compensate for:

(A) Horizontal length of breeching or smoke pipe;

(B) Extra internal resistance of heater;

(C) Smoke flue heat losses, where smoke flues are used for aspirating effect in vent flues;

(D) Such further heights as may be necessary to extend above high point of building served and as much higher as may be necessary to attain free wind action at top.

2. Smooth Inside. Chimneys shall be constructed substantially, true and plumb, and shall be tight and smooth inside.

3. Smoke Flues in Vent Flues. All smoke flues used for the purpose of aspirating effect in vent flues, shall be securely stayed and supported at the centers of the vent flues, shall be made tight at all joints, and shall extend not less than 8 in. above the vent flue. Where such flues are 12 in. or less in diameter, they shall be made of substantial cast-iron. Where such flues are more than 12 in. in diameter they may be constructed of steel plate of suitable thickness.

NOTE: So many failures have been reported for vitrified-tile aspiration smoke flues that such material cannot be recommended. Ordinary flue lining is not at all acceptable for this purpose because the joints cannot be made permanently tight.

Cast-iron smoke flues may be constructed of manufactured smoke pipe or "Class A" water pipe, or of cast-iron sewer pipe.

4. Clean-Outs. All chimneys and flues shall be provided with adequate clean-outs, readily accessible, and tight when closed.

Order 5868—Fans.

1. Type and Capacity. All fans shall be of appropriate type for service under conditions of pressure or suction to be encountered in practice, and shall be selected on basis of performance against the resistance of the system as installed.

2. Extra Capacity for Draw-Through. Fans installed to handle heated air for ventilation purposes, such as in draw-through arrangements, shall have excess capacity of not less than 1% for each 5° F. above 70° F. of temperature of air handled.

3. Noiseless Operation. Fans installed in buildings where noisy operation would be objectionable, shall be so located and set, and shall be of such type and outlet velocity in practical use, that reasonably quiet operation is assured.

4. Engine Out of Air-Ways. Exposed engines and similar motive power and apparatus, except electric motors, for fan drives shall be kept out of air-ways.

5. Gravity By-Pass for Fan-Furnace Installation. Fans used in conjunction with furnace installations shall be equipped with suitable gravity by-passes, preferably automatic, so that adequate air supply to furnaces will be assured when fans are not in operation.

Order 5869—Ducts.

1. Design. All ducts shall be designed to promote the unrestricted flow of air, and to facilitate easy access for cleaning.

NOTES: Ventilation ducts and equipment should generally be of such sizes that the velocities through free areas thereof *will not exceed* the following limits. No vent duct should be less than equivalent to 6-in. diameter. In mechanical systems, where rooms such as kitchens, toilets and wardrobes are ventilated by air movement from adjacent rooms or corridors, the vent ducts should be proportioned on basis of gravity size unless direct connected to exhaust fan.

Part of System	Mechanical System F.P.M.	Gravity System F.P.M.
1. Intakes, opening.....	1000	300
2. Blast Coils (steam)....	1000	...
3. Gravity Indirect (steam)		300
4. Furnace Air-Ways.....	....	600
5. Main Trunk Ducts....	1500	300
6. Branch Trunk Ducts..	1200	300
7. Branch Ducts — rect. sides less than 2:1..	....	750
Branch Ducts — rect. sides greater than 2:1	....	500
8. Side-Wall Inlet.....See Order 5871		
9. Vertical Inlet Flues....	500	300
10. Vertical Vent. Flues...	500	300
11. Return-Air Flues.....	1000	300
12. Roof Ventilators.....	750	450

2. Not Service Thoroughfares. Air supply ducts, including chambers and air-ways, shall be used for the purpose of furnishing clean air to occupied areas, and shall not be designed, considered or used for any other purpose.

3. Underground Air Supply Ducts. Underground ducts shall not be considered permissible for conveying inlet air supply unless they are made and equipped as follows:

(A) Thoroughly water-proof;

(B) Provided with ample free drainage to a lower room of building so that no water may stand anywhere in the ducts;

(C) Without direct sewer connections;

(D) Not less than 3 ft. in the clear vertically and 2½ ft. horizontally; except that branch underground ducts not more than 16 ft. long may be reduced to 2 ft. in the clear vertically and horizontally if the top of the branch duct is flush with top of main duct, and the drainage pitch of branch duct is not less than 1 in. in 8 ft. toward the main duct;

(E) Provided with appropriate illumination and access for inspection and cleaning service.

4. Illumination. Appropriate provision shall be made for illumination of interior of fresh-air ducts, particularly those large enough for human access, to facilitate cleaning and inspection service.

5. Turns. All ducts, particularly those containing gravity currents, shall be made as direct as possible, and all turns shall be accomplished with the least practicable resistance to the contained air currents.

6. Construction. All ducts shall be substantially made, and all air supply ducts shall be made and maintained smooth inside so as to prevent accumulation of dust and to avoid undue

resistance of air currents, and all ducts shall be tight enough to prevent undue leakage or infiltration. Ducts constructed of material otherwise presenting a rough surface to the flow of air, shall be tightly lined throughout inside with sheet metal.

7. Sheet Metal Piping. The gauges and the construction of sheet metal ducts shall be appropriate for the size, position, location and service of the respective ducts; they shall be securely supported in place and made of such materials, or shall be protected, as to insure reasonable permanence.

8. Gravity Outlet Ducts. Outlet ducts for gravity systems shall be so located, or equipped with heat service, that the required or calculated air currents will be assured.

NOTE: In steam systems it is an easy matter to install aspiration service. Often a length of properly vented 2-in. pipe extending up in the vent flue will be sufficient to assure positive air flow.

9. Insulation of Outlet Ducts. Where outlet ducts pass through unheated spaces, or are located in or adjacent to exposed walls, they shall be appropriately insulated against loss of heat from the contained air.

10. Outlet Ducts Separate. Outlet ducts shall not be combined anywhere between room outlet openings and gathering chambers or outside atmosphere unless direct-connected to exhaust fan; except that where heated, such as by stack heater, central smoke flue, or aspirating coils, such outlet ducts may be combined, but not within 6 ft. above or below the outlet openings; and except that gravity outlet ducts may be combined immediately below the final delivery to outside atmosphere, such as at base of roof ventilator.

11. Termination of Outlet Ducts. Outlet ducts used in conjunction with mechanical ventilation system inlets may terminate in incombustible gathering chambers, and may terminate in general attic space when the attic floor is fireproof; provided such ducts terminate in incombustible 90° elbows, or provided other adequate fire hazard precautions are used.

NOTE: Gravity ventilation system outlet ducts may never terminate in the attic space.

12. Outlet Ducts Horizontal Run, in Gravity Systems. Horizontal runs in outlet ducts of gravity ventilating systems shall be avoided wherever possible, and maximum practicable inclination from horizontal shall be provided in all cases. Where horizontal runs are unavoidable they shall be not less than 20% larger in free area than the required area of the connected vertical runs. The horizontal component or projection of any outlet circuit shall not exceed 30% of the vertical component or projection of the same circuit, between room outlet and the attic or gathering chamber, unless connected to exhaust fan.

Where a plenum system of ventilation is installed and the vent flues terminate in a common vent chamber or duct in the attic, the final exit from the vent chamber or duct may be through one or more outlets of adequate size; provided that no flue served by such outlet shall be more than 50 feet distant from the outlet.

NOTE: A plenum system of ventilation is where a fan is used only to supply fresh air.

13. Outlet Ducts Above Roof. Final delivery of all outlet circuits shall be protected from weather, and shall be so located and constructed as to prevent contamination of air supply for or in any occupied area. Gravity outlet ducts shall extend to points well above high portions of roofs or parapets.

NOTE: Siphon ventilators are acceptable as gravity outlet terminals and are often advisable, but their siphonic action is not generally dependable enough for consideration in calculating size or activity of outlet circuits. Restriction of the effective area of outlet and outlet ducts, due to use of siphon ventilators, is not permitted.

Order 5870—Volume Dampers and Deflectors.

Necessary volume dampers, splitters and deflectors, shall be provided for all ducts to permit accurate balancing of the system, and such dampers, splitters and deflectors shall be properly set according to metered tests of the system, and shall then be securely locked in place or otherwise made reasonably meddle-proof, in an approved manner.

Order 5871—Inlets and Outlets.

1. Where Required. Inlets and outlets shall be provided and maintained for all ventilation systems.

2. Elevator Shafts Not Ventilator Shafts. Elevator shafts shall not be considered or used for ventilation purposes nor shall they be allowed to interfere with the effectiveness of installations hereunder.

3. Heat, Smoke, Gas and Odor Removal. Where ventilation involves removal of heat or smoke, or relatively light gas or odor, upward ventilation shall be provided wherever practicable; where normal upward ventilation is impracticable appropriate auxiliary outlets shall be provided in, at, or near the ceiling. Where removal of relatively heavy air, gas, odor, or other substances is similarly involved, the outlets therefor shall be in, at, or near the floor, wherever practicable.

4. Number and Arrangement. The capacity, number and arrangement of inlets and outlets shall be such as to insure a uniform distribution of air throughout the areas served during all periods of occupancy, and to accomplish the desired intimate contact with the body of each occupant.

5. Inlets and Outlets for All Gravity Systems. Gravity inlets and outlets shall be suitably arranged in room walls except as hereinafter provided, and in such manner as to use every possible natural advantage such as influence of prevailing winds and gravity distribution; and such inlets and outlets shall not be restricted in effective size.

6. Inlet Grilles or Diffusers Required. All inlets, except out-door openings, shall be equipped with suitable grilles or devices which promote uniform distribution of air.

7. Floor Inlets and Outlets Prohibited. Inlets in floors shall not be considered permissible in areas classified under Order 5845; nor in other areas where subject to contamination of inlet air incident to foot traffic or other floorline conditions; except in churches served by gravity furnace systems.

Outlets in floors shall not be considered permissible in areas classified under Order 5845; nor in other areas where air passing therethrough is at any time recirculated before delivery to outside atmosphere; nor in conjunction with gravity outlet ducts unless adequately protected against contamination incident to foot traffic and other floorline conditions; except in churches served by gravity furnace systems.

Order 5872—Direct Radiation.

1. Radiators Recessed or Elevated. Direct radiation installed in gymnasiums, playrooms, and similar occupied areas, or in passageways, or in auditoriums, shall be fully recessed or elevated not less than 7 ft. above the floor; unless effectively guarded against personal contact and arranged to prevent obstruction to traffic.

2. Shields Required, Construction and Arrangement. Direct radiators and similar sources of radiant heat, installed within 2½ ft. of fixed seats shall be provided with suitable insulated shields constructed and arranged to effect convective air currents and at the same time protect the adjacent occupants from direct radiant heat; and, generally, such shields shall be not less than 6 in. clear above the floor of the room served nor more than 4 in. further from the floor than the bottom of the radiator.

NOTE: While shields are required to protect adjacent persons from undue radiant heat, they also make the radiator more effective than would otherwise be experienced. It is, therefore, reasonable to expect radiators to be generally equipped with shields in sedentary occupied areas, even though persons may not be habitually seated within the minimum distance specified in the code.

Order 5873—Indirect Radiation.

1. Gravity Ventilation Systems. In every gravity indirect ventilation system a sufficient amount of indirect radiation shall be provided to suitably warm and deliver the calculated volume of fresh air in the coldest weather and also when there is a difference of 40° F. between room temperature and outside temperature.

2. Free Air-Way Required. The net free air-way through and about indirect radiation surfaces shall be so arranged and of sufficient capacity to accommodate the calculated air volume at a reasonable velocity.

3. Arrangement. In gravity indirect ventilation systems:

(A) The indirect radiation shall be installed directly under the vertical duct served; or immediately adjacent and with clear space equal to the depth of such flue over the top of the radiation and below the top of the opening into the flue.

(B) The air to be heated shall be admitted below the indirect radiation and shall rise vertically therethrough to flues served.

(C) Mixing dampers operative from the rooms served, shall be provided and maintained so that either warm air or cool air or both will be admitted to such room, individually.

4. Valves. In gravity ventilation systems of the steam or hot water type, there shall be no shut-off valves controlling the indirect radiation, except main line valves which also control the indirect radiation.

5. Capacity. The heating capacity of indirect radiation shall be calculated on the basis of normal working pressure of steam or vapor, or the normal working temperature of hot water, respectively, used for direct radiation of same supply line.

Order 5874—Humidifiers.

1. Location. Humidifiers used in conjunction with ventilation systems shall be so located and arranged that they will effectively treat all the ventilation air handled by the ventilation system; unless otherwise permitted by the Industrial Commission.

2. Capacity. Humidifiers shall be calculated, maintained and operated on the basis of not less than 40% relative humidity, measured at 70° F. for total air supply; unless otherwise directed by the Industrial Commission.

3. Water Pans. The reservoir capacity in connection with water pan humidifiers shall be not less than enough for one normal day of operation.

The water level in water pan humidifiers having supplementary reservoirs or supplied from pressure systems, shall be controlled and maintained by means of float valves or similar automatic devices in the water supply lines outside of the heat chambers.

The evaporative surface of water pan humidifiers shall not be less than equivalent to 200 sq. in. of plain water pan evaporation surface per 1000 cu. ft. of air supply to be treated.

Water pan humidifiers shall be located in the heated air chambers of heater unit, or in similar location.

Order 5875—Piping.

1. Pipe Sizes and Arrangement. All steam and hot water supply and return piping and air line piping shall be of appropriate sizes, elevations and arrangement to accomplish the calculated services in practical operation, without undue noise, stress or other detriment; and shall be adequately shown on plans submitted for approval.

2. Expansion and Contraction. Appropriate anchors, expansion swings or joints, supports and similar trade essentials shall be provided in every piping system.

Administration

The Heating and Ventilation Code will be enforced in co-operation with local officials, who are required by law to enforce all orders of the commission which are germane to their respective duties (Section 101.28 of the Revised Statutes). With the State Heating and Ventilation Code as a foundation, city ordinances may go more in detail, if desired, or may contain more stringent requirements than the State code, but in every case the State code requirements are required to be enforced as a minimum.

To secure best results plans should be filed with, and be approved by, the city building inspector as now obtains in the requirement for the submission of building plans and the obtaining of a building permit in the cities of Appleton, Beloit, Eau Claire, Fond du Lac, Green Bay, Janesville, Kenosha, Manitowoc, Milwaukee, Oshkosh, Racine, Sheboygan, Shorewood, Superior, West Allis. The requirement for submission of plans for heating and ventilation installations to the Industrial Commission for approval is waived in cities where the code is enforced and plans are approved in a manner acceptable to the Industrial Commission. Regardless of the size, all cities should require permits for building construction and equipment, using the State code as a minimum standard in case there is no more restrictive local ordinance.

APPEAL

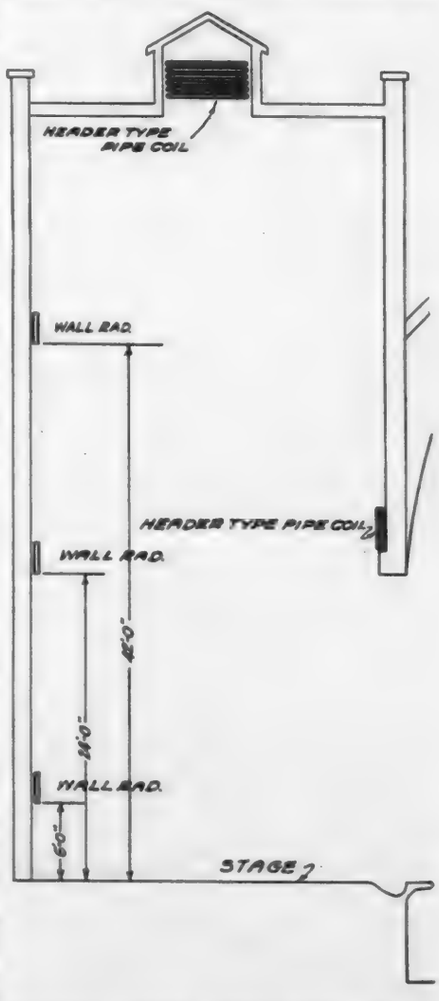
Any person who considers any part of the Heating and Ventilation Code, or any official's interpretation of the code, to be unreasonable, may appeal to the commission to interpret, modify, or suspend the same. (See Sections 101.15, 101.16 and 101.17 of the Revised Statutes).

The Heating and Ventilation Code Advisory Committee, consisting of those named above*, acts as an advisory committee to the commission in all matters pertaining to heating and ventilation of public buildings and places of employment. Any person who is dissatisfied with any technical ruling of any inspector, may appeal to the Heating and Ventilation Code Advisory Committee, whose decision will be submitted to the commission for consideration.

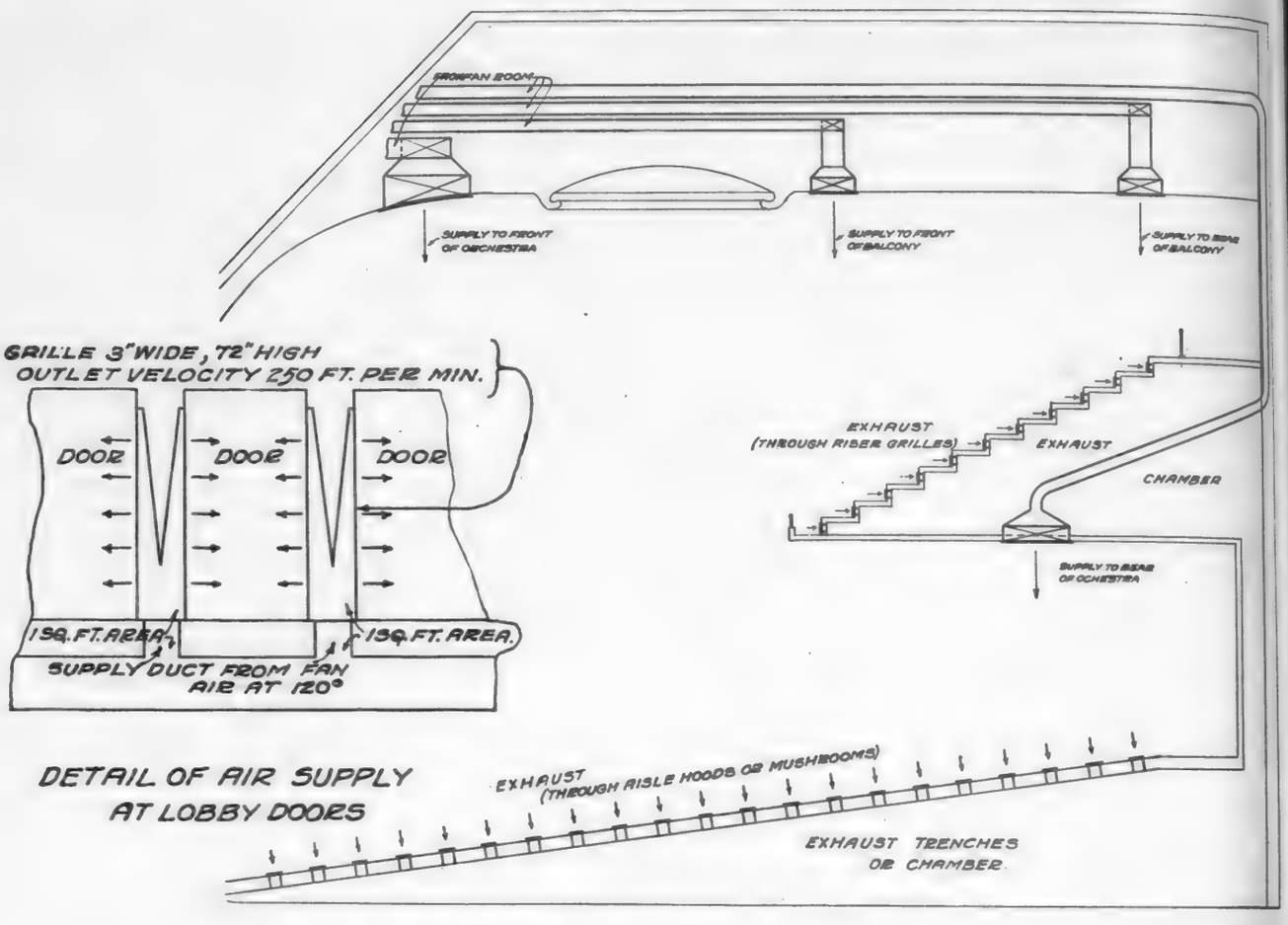
* This list was published in THE HEATING AND VENTILATING MAGAZINE for May, 1925.

Ventilation and Cooling of Motion Picture Theatres

MANY useful points on the ventilation and cooling of motion picture theatres are given by D. D. Kimball, of New York, in an article on the subject appearing in the *Architectural Forum* for June, 1925. While the heating problem in such theatres exists in its simplest form, as Mr. Kimball points out, there are two points at which ample heating is essential. One is the main entrance lobby and foyer, and the other is the stage. The practice is recommended of using a separate fan system for heating the main entrance lobby, admitting the heated air through grills placed at each side of each entrance door. A second row of grills is recommended to be placed near the second row of doors. The heating coils to warm this air should be capable of raising the temperature of the air to at least 120°. In addition the practice is recommended of providing direct radiation in



Section Through Typical Stage Showing Disposition of Radiation


FROM FAN ROOM
SUPPLY TO FRONT OF ORCHESTRA
SUPPLY TO FRONT OF BALCONY
SUPPLY TO REAR OF BALCONY
GRILLE 3" WIDE, 72" HIGH
OUTLET VELOCITY 250 FT. PER MIN.
DOOR
DOOR
DOOR
EXHAUST (THROUGH RISER GRILLES)
EXHAUST CHAMBER
SUPPLY TO REAR OF ORCHESTRA
150 FT. AREA
150 FT. AREA
SUPPLY DUCT FROM FAN AIR AT 120°
DETAIL OF AIR SUPPLY AT LOBBY DOORS
EXHAUST (THROUGH AISLE HOODS OR MUSHROOMS)
EXHAUST TRENCHES OR CHAMBER

Section Through Typical Theatre Showing Method of Ventilating Orchestra and Balcony

the lobby for use primarily when the fan is not running.

Ample radiation for the stage is urged, with thorough distribution. Where the stage walls are high Mr. Kimball advocates the placing of radiation at two or three levels on the exposed walls, one-third about 6 ft. above the stage floor, one-third about 24 ft. above the floor and the remaining third from 40 to 50 ft. above the floor. Additional radiation, he adds, should be provided in the form of a pipe coil in the skylight over the stage.

If the front of the stage over the proscenium opening extends well above the roof of the theatre proper coils should be placed on this wall, also.

The vacuum return-line system is advocated as being quicker in operation, more efficient, and more economical in fuel consumption. In the division of the heating mains separate mains are recommended for the theatre proper, lobbies, stage, dressing rooms, store and offices (if such are included), hot water storage tank, house and sprinkler tanks of all kinds. As a rule each set of mains, it is added, should be valved at and run from the main boiler header.

For ventilating and "de-heating" the theatre Mr. Kimball recommends a fresh-air system and an exhaust system, both mechanical. The temperature of the incoming air may be as low as 55° to 60°. For this reason Mr. Kimball advocates the downward system so as to obviate the discomfort of having cool air strike the feet and lower limbs of those in the theatre. The ventilating system, he adds, should be so arranged that the air supplied to the different portions of the theatre may be introduced at different temperatures. The design should make possible the recirculation of a considerable portion of the air used. In such cases the installation should include appliances for washing or mechanically filtering the air.

Mr. Kimball speaks of the rapid growth of the practice of providing cooling equipment for theatres, and points out that the only efficient theatre cooling system which will actually give the desired effect is one that includes a refrigerating apparatus. He places the cost of such an installation at $12 to $15 per seat. Approximately 200 tons of refrigerating capacity, he figures, is required for a 3000-seat theatre. The refrigerating medium recommended is CO_2.

Certified Heating in Chicago

Following closely upon the announcement of the adoption of the certified heating plan by the Chicago Master Steam Fitters Association comes the announcement that a similar plan has been adopted by the Chicago Heating and Piping Association. In an announcement issued by this association it is stated that all heating plants installed by the members and stamped and approved by the association are to be fully guaranteed. Before any installation is made members are now required to furnish a plan to the association inspector, with full layout of piping, boiler size and amount of radiation installed in each room. A building plan must accompany this layout so that the correct amount of glass, exposed wall, roof and cubical contents may be determined.

All plans are then to be numbered, registered and a copy left on file at the association's office. Should the contractor not have ample size boiler of sufficient radiation the inspector will demand an increase in size. The same holds true of the pipe sizes.

All inspected plans will bear the corporation seal, will be stamped and given a registered serial number and signature of the inspector.

Contractor members will be required to make a report on each job so registered when completed.

Correspondence

Computing the Size of Condensation Pumping Equipment

EDITOR HEATING AND VENTILATING MAGAZINE:

Can you tell me what basis has been adopted as standard for computing the condensation from radiators? I find from looking through various catalogs of concerns making condensation pumping equipment that there is a rather wide variation in some instances.

In other words, the tabular matter gives a certain number of square feet of direct radiation for which a definite size of condensation receiver is listed. Has any standard been established for computing the amount of condensate per hour resulting from a definite number of square feet of direct radiation at room temperature of 60°, or maybe there has been a standard set for various degrees?

The volume of condensation varies fully 40% per square foot of equivalent direct radiation according to the installation. The volume of air also varies as outlined elsewhere in this issue in answer to another correspondent. (See also THE HEATING AND VENTILATING MAGAZINE for May, 1925, p. 93 and the Guide, A.S.H. & V.E., p. 75).

Pumps must of necessity be large enough to handle the peak load of air and water which would occur when the heating system was starting up from cold and was full of air. For these reasons and because of the many other variables that enter into the problem, manufacturers of condensation pumping equipment conservatively use a large factor of safety. For example, experience with reciprocating steam-driven vacuum pumps indicates that for most favorable conditions the use of water cylinders of less displacement than eight times the normal volume of condensation is seldom safe. With radiation divided into small units a ratio of at least 10 to 1 will be required.

Ratings for the rotating combination units should be based substantially on a 10 to 1 ratio of the combined displacement of water and air cylinders the ratio of these cylinders to each other being about 2 of water displacement to 8 of air. In these pumps, the displacement of water must be high on account of the constant speed, while a lower proportion of air displacement may be taken because of the high efficiency of the air chamber as compared with reciprocating pump cylinders which have greater clearance.

As to the amount of condensation resulting from a square foot of direct radiation—this varies with the height, width and length of each radiating unit, as well as with the temperature of the heating medium and the air surrounding the radiator. For steam at about atmospheric pressure (latent heat) 970 B.T.U.) and room temperature of 70°, it is customary to allow 250 B.T.U., or 250 ÷ 970 = ¼ lb. of condensation. For room temperatures of 60° the transmission would be 265 B.T.U. and, therefore, the amount of condensation would be increased about 6%. (See Standard Heating and Ventilating Data Sheet No. 13-TT, as published by THE HEATING AND VENTILATING MAGAZINE, covering this and other temperature conditions).

The condensation in the piping must be taken into account, usually 10% of that of the radiation, or less if return pipes are also insulated. The proportions of air and water, of course, will vary according to the proportionate amount of direct and indirect radiating surface, as well as with the various other factors stated elsewhere.

T. W. REYNOLDS.

Equalizing and Drip Connections of Boilers

EDITOR HEATING AND VENTILATING MAGAZINE:

Referring to the accompanying illustrations, which appeared in your June issue and which had to do with the so-called Hartford return connection, I have had considerable experience with such connections and have found that they will give trouble under proper operating conditions.

Referring particularly to Fig. 57, showing the drip line as taken off the main, it is my sad experience that this line absolutely must not be a drip, but must be used for equalizing purposes only and must be taken off the vertical pipe immediately next the boiler.

Another criticism I offer is that all of your connections are made at the waterline. This situation means that whenever a perceptible drop in pressure is obtained, the water will dance up and down in the equalizer line and will cause an intermittent flow of steam and water at the return header or return connection, resulting in pounding at that point.

In Fig. 58 you call for the return header 6 in. below the water-line; this will stop the pounding condition mentioned above. I believe that under normal conditions a distance of 6 in. below the water-line to centre-line of pipe is somewhat too great. It has been my practice to install the return pipe at a point submerged 2 in. below the water-line, which would be somewhat higher than the point you have indicated.

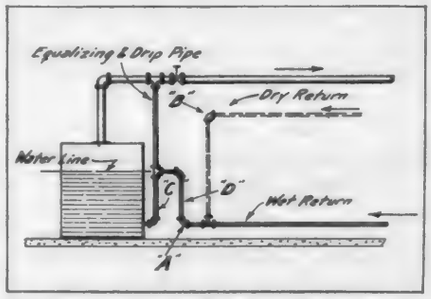
It is simply my idea to suggest that the connection between the wet return and the equalizer must be submerged.

Denver, Colo. L. A. M.

The difficulties cited by our correspondent and his remarks are in general as stated in the *article referred to, with the exception of a preference for drip pipes to be separate from any pipe used as an equalizer and a 2-in. submersion of return header as better than one of 6 in.

His suggestion that the equalizing connection at the wet return be submerged was the basis of the previous article and it is for this reason that 6 in. was the distance specified as necessary from the center-line of the return header up to the normal boiler water-line. Advocation of submersion at this point and at the same time for a distance of only 2 in. is not quite consistent as the latter would not submerge the return header, but would leave the upper portion capable of receiving steam and causing the difficulties to which he refers. This would probably be true even in the smallest return header advisable, for even in a 3-in. return header, slight fluctuations of the water-line from dirty water or other causes would expose the top of the return header. Six inches was not a hit-or-miss method, but is the remedy found by one large sales engineering company for difficulties experienced due to lesser distances, this distance being used ever since and with entire satisfaction. Water in the boiler can lower 6 in. and still leave 12 in. or more of water over the crown sheet as a measure of safety.

Using equalizing pipes for drip pipes is standard practice and seems to give no trouble. In many cases equalizing

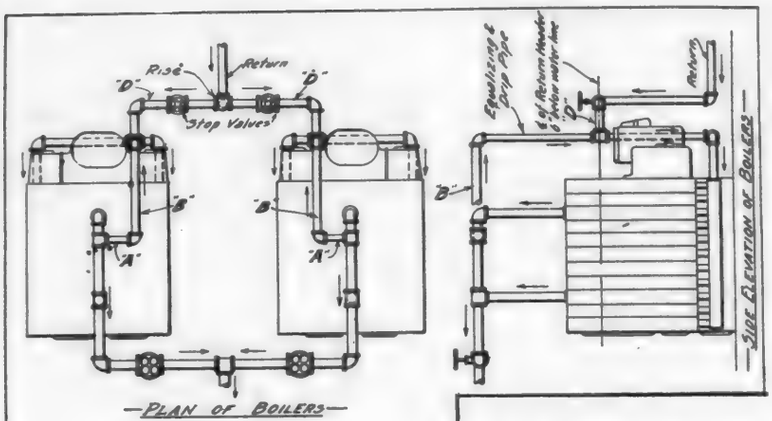


How the Need for Check Valves at Boilers may be Eliminated by Water-Sealing the Returns
(*Fig. 57 in June issue*)

pipes are in reality mere drip pipes; in fact, it is quite common to substitute the name of one for the other. A slight amount of drip can easily be taken care of in an equalizing pipe of ample size, although, of course, a separate drip should be used where the distance of the drip connection from the boiler would be far enough from the boiler to cause a perceptible drop in pressure.

Troubles of the correspondent are probably due to using pipes of insuffi-

* See HEATING AND VENTILATING MAGAZINE for June, 1925, P. 66, last paragraph.



Piping Connections for Two Cast-Iron Sectional Boilers

(*Fig. 58 in June issue*)

cient size or with too many turns. However, it would doubtless be of benefit to learn the details of these troubles and their probable cause, as the matter of equalizing and drip connections has long been solely a matter of opinion, habit or guess; hence the purpose of the article to which he refers, an article covering the ideas of those who have given the subject considerable study and experiment in an endeavor to overcome the troubles of the past in this connection.

Estimating Data for the Sheet-Metal Contractor

EDITOR HEATING AND VENTILATING MAGAZINE:

Being a sheet-metal worker employed in the manufacture and erection of sheet-metal work pertaining to heating and ventilating systems, and desirous of entering the contracting field within a few years, I am desirous of obtaining information referring to estimating on that branch of the heating and ventilating industry.

From information I have obtained through various books I am led to believe that jobs are estimated at a certain price per pound of material used, but the information I have does not cover that point thoroughly. For the past few years I have kept records of the time required to manufacture and erect various fittings, but through that channel progress has been very slow.

As you know, ft is rather difficult to get employment with concerns specializing in that branch of work without some knowledge of estimating. Can you furnish me with a list of books or charts covering this subject, wherein the fundamentals of estimating are included and, if possible, the cost of making ducts and various fittings

Philadelphia, Pa. A. E. B.

Broadly speaking, estimating consists of planning the work to be done, visualizing and recording the necessary steps to carry out this plan, applying material and labor costs to each item, and then to the total an allowance for overhead and profit.

In the estimate under consideration, one can start by figuring what the shops can handle in a day. Thus, 500 lbs. of sheet metal can be worked up by one man per day in the shop at a labor cost of $10.00. Next, 350 lbs. of sheet-metal can be erected on the job by a man and helper at a total cost of $18.00 per day, which, by the way, shows the importance of doing as much of the work as possible in the shops, rather than on the job.

After adding 33 1/3% of the *labor cost for contractors' profit, overhead and similar customary items, it will be found that the total cost in place will run about 35 to 40 cents per pound on jobs costing $500.00 or less and 25 to 30 cents per pound on jobs where the total cost exceeds this amount. Of course, in estimating sheet-metal work, or, for that matter, in any other branch of estimating, much depends upon judgment based upon practical experience. Work in any way deviating from the regular should be allowed for by a compensating increase in the basic rates. On the other hand, a job with a lot of flues in proportion to the other work would have a lower pound price as flues do not have as many transformations and connecting branches as do the mains, hence the labor of their erection is considerably less.

Although straight round pipe is frequently sold by the running foot, the usual practice in estimating sheet-metal work, at least for heating and ventilating systems, is the pound price basis. This much may be said to be standardized, but among estimators there is hardly any uniformity in the application of the method, so far as the details are concerned. Each has a way of allowing for this or that, but however they do it, they nearly all arrive at approximately the same sum total, simply because their method is usually the result of working backwards from known total quantities and costs of previous work, in this way obtaining a unit cost which they apply to all jobs—applied with judgment, of course, as above stated.

Theoretically, the kind of seams and the gauge of material used would have some bearing upon the pound price, but practically, within reasonable limits, they should not affect the estimate. Neither is it necessary to figure the actual time consumed in making each transformation as the cost of any difficult item of the work is absorbed in the total work, unless the job is very small and more in the nature of repair work, in which case it is not difficult to estimate the time required. However, it may be said that a few estimators who specialize on sheet-metal work take into account in their estimate each item—quadrants, dampers, deflectors, and sundry other items of a similar nature. As their estimates usually approximate those of others it would seem, with but little time to spare when business is plentiful and with estimates which must be rushed out or business lost altogether, that any perfection of accuracy in figures so obtained is offset by the cost of the additional time required. On small work such detailed estimates may be necessary, in which case a knowledge of the time assumed in making transformations would come in handy.

Labor hours are the greater and more uncertain factor but an estimator cannot go far wrong if he has carefully figured the total weight of material required and knows from experience the average weight of sheet metal which can be handled by the workers in a given time. Of course, in starting up in the sheet-metal business one should figure conservatively, rather than fail at the beginning, for there is more of a tendency to overlook some item than to include something unnecessary to the job.

In figuring the weight of material the estimator should start with the fan, for it is made of sheet metal and usually must be assembled on the job. Heater casings are next in order and the amount of bracing required must be given some thought as to the labor involved in their erection. Bracing for the ducts is included in a percentage of the total weight of sheet metal. This percentage also includes the weight of material in seams and waste in cutting

* Note that this does not include the cost of material; note also that rates for labor and the material costs vary, of course, with the time and with the place.

and will range anywhere from 10% to 25% of the total weight of sheet metal, according to the character of the pipe. For example, rectangular pipes require more lap and more bracing than round pipes. Incidentally, it is important to note that the heavier the bracing, the lighter the gauge which may be used. Many helpful tables are published giving the weight of round and rectangular pipes of various sizes and thicknesses. (See Data Sheets Nos. 10H, 10I, 10L, 11, 11E, 11F, 11G, 11H, 11I, 11J, 169E and 169F, as published by THE HEATING AND VENTILATING MAGAZINE.)

Sometimes seams are specified to be soldered and, as this is unusual and quite an item of expense, it is necessary to calculate the total lineal feet of seam and use some price based upon experience. For example, a job having 2500 lin. ft. of soldered seams was recently figured at a total cost of $500.00 for seams alone. A considerable portion of the seams are seldom soldered, even though so specified, as many of the ducts are concealed by the time of inspection in which case there is no way of knowing what kind of seam has been used.

The estimating data as given throughout apply to sheet metal of the usual gauges in ventilating systems. Much heavier metals, such as those used in the construction of smoke breechings would have a different pound price. Cost of covering and painting are not included as such work is usually done by others.

T. W. REYNOLDS.

Proportionate Amounts and Velocities of Air and Water in Vacuum Return Lines

EDITOR HEATING AND VENTILATING MAGAZINE:

Recently we had quite a discussion in our office on figuring the velocity of condensation in a vacuum line. The writer would like to know how the average engineer would go about determining the velocity, and just what proportion of the pipe he would consider the water, vapor and air would take up. Also, if the suction of the pump in giving the air quite a velocity would have any appreciable effect on the condensation or whether the condensation just flows back to the pump by gravity.

Brooklyn, N. Y. E. A. F.

Those who have had occasion to go into these matters in detail, say in large installations, or where there are long runs of return pipe, usually make use of D'Arcy's formula and figure half and half, air and water. However, the volume of condensation varies fully 40% per square foot of equivalent direct radiation, according to the installation. There would be less air in an installation made up largely of indirect radiating surface or where the direct radiation was divided into larger units because of the fewer points for air infiltration. Indirect radiation must be reduced to its equivalent in direct radiation in order to obtain the amount of condensation, but the air capacities for this class of radiation may be the same as for direct radiation.

The volume of air, water, vapor, steam and gases from impurities also varies with the initial and final pressures, efficiency of the radiator traps, quality of workmanship as to tightness of the system, the kind of impurities in the boiler-feed and the cooling effect in the return (whether insulated or not).

Large volumes of condensation entering the main return near the pump require greater displacement than in returns where most of the vapor would have time to condense before reaching the pump. Lifts in the return also increase the displacement, due to expansion of the elastic fluids under the greater terminal vacuum required. Likewise, systems in which the vacuum extends to the radiators and supply lines are subject to greater infiltration of air around valves and fittings than would otherwise be the case. In the final analysis, good judgment based on a wide experience is of more value than any theoretical formula.

Condensation in the returns is not formed as a solid mass, hence the flow is back by gravity, the differential exerting no effect. Air velocity would be not much more than that of the water and only in returns of very small size would the velocity of the air tend to ripple the water and so exert some slight effort in accelerating the flow of condensation.

For further information along these lines see THE HEATING AND VENTILATING MAGAZINE for May, 1925, p. 93, also the Guide, A.S.H. & V.E., p. 75.

Inconsistencies in Heat Transmission Factors

EDITOR HEATING AND VENTILATING MAGAZINE:

Referring to your Heating and Ventilating Data Sheets, your heat loss coefficients for brick walls (Data Sheet No. 1-A) seem to be wrong. The coefficients for plain brick walls in every case, except for the 16-in. thickness, are lower than the coefficients for transmission through plastered walls. We believe that these two tables should be reversed.

Also on Data Sheet 1-B, we do not understand why the heat loss coefficient for a 12-in. limestone wall is less than for a 12-in. sandstone wall when all the rest of the coefficients for other thicknesses of limestone are greater than for the same thickness of sandstone.

Louisville, Ky J. C. L.

Our correspondent is correct regarding the inconsistency of the heat-loss factors as published. However, in covering such a complete line of wall construction as is given in the Data Sheets, it was necessary to adopt values as developed by several different authorities. For instance, the coefficients for the plain brick wall were those used by one set of authorities, including Carpenter, the German government, the Austrian government, Recknagel, Reitschel and others. When it came to the question of a brick wall plastered it was necessary to compile factors from some other source or authority. Therefore the effect mentioned by our correspondent is the result of accepting certain authorities upon the construction with which they have experimented and accepting other authorities for other constructions upon which the first have not experimented. The lime and sandstone coefficients are explainable in the same way.

Just which coefficients are to be accepted in any particular case is largely a matter of judgment based upon a comparison of these as a whole or an average of the authorities considered the most reliable for modern construction. No averages can be made that will be comparative throughout, since so many variables enter in that it is seldom that tests check even with each other. The fact is that for practical use, the importance of wall factors has been lessened, owing to the larger proportion of glass surface now being used and the relatively greater heat loss of the glass. Therefore, care in computing the window and door area, the window factor, and the allowance for exposure and leakage, are the more essential items.

From time to time these inconsistencies have been pointed out by our readers and as often we have considered some practical solution of the matter. Outside of making the tables "look right," there does not seem to be any reliable basis upon which to suggest changes.

Engineers License Law in California

California has just passed a law for the licensing of professional engineers. It provides for a board of registration made up of five professional engineers to be appointed by the governor. The list of licensed engineers is to be filed each year with the Secretary of State and clerk of each county and published in at least two daily newspapers. The license fee is $25.00 and the charge for renewal of licenses will be $5.00 each year.

Professional engineers must have at least six years' practice to entitle them to registration certificates. Applicants must have at least one year's experience in charge of work. Engineering diplomas count for four years of practice. Reciprocal registration of licensed engineers of other States is provided for upon payment of a $15.00 fee.

National Warm-Air Heating and Ventilating Association

Appointment of Publicity Director

The appointment is announced of L. Wayne Arny of Philadelphia as Publicity Director of the National Warm-Air Heating and Ventilating Association. This appointment was made by the association's Educational Publicity Committee at its meeting in Columbus, O., June 3.

L. Wayne Arny,
Director of Public Relations for the National Warm-Air Heating and Ventilating Association

At the same time the committee outlined its activities for the conduct of the N.W.A.H. & V.A. Educational Publicity Bureau. The objects of the bureau are defined as:

1. To tell the public the truth about warm-air heating.
2. To see that every job is installed to the standard code.
3. To secure the co-operation of all dealers and heating contractors.
4. To seek the fulfillment of the association's code of ethics.

To accomplish these objects the methods include the engagement of the publicity director whose headquarters will be in Columbus, O.; the publication of an illustrated consumer booklet which will contain the association's installation code for warm-air furnaces in residences; story articles in home papers; a plan for uniform publicity and use of burner copy by all members; the organization of co-operative advertising between dealers and manufacturers; efforts to have the standard code adopted in building ordinances; and measures to maintain personal contact with architects, contractors, real estate exchangers, schools, universities, city organizations and all State and national organizations of sheet-metal contractors.

The plans as outlined by the committee covers a five-year period.

Mr. Arny, the new publicity director, has been active in general publicity work. He took up his new duties July 1.

National Association of Master Plumbers

With an attendance which compared well with that of previous meetings and with exhibits of the products of some 60 manufacturers of heating and plumbing appliances and apparatus, the forty-third annual convention of the National Association of Master Plumbers in Portland, Ore., June 23-25, 1925, will take rank as one of the most successful in the association's history. In spite of the long distance which many of the delegates had to travel to reach the convention city, the various sections of the country, including the east, were well represented. The official registration was 350.

For president for the ensuing year Henry E. Longley of Wilmington, N. C., was elected unanimously and Albert J. Wilson of California was chosen vice-president. The other officers elected are: Treasurer, Richard J. Welch; secretary, Wilbur Dosher, of Wilmington, N. C.

A movement to establish permanent headquarters for the association was the subject of a long discussion at one of the sessions. The plan was finally turned down, although the new board of directors was instructed to consider the suggestion and report at next year's convention. The annual dues of the association were increased from $4.00 to $5.00 a year.

Louisville, Ky., was selected as the convention city for 1926.

Among the resolutions adopted was one calling attention to the development of the installment payment plan in other industries, and urging that the board of directors study this plan and the best method of applying it to the plumbing industry.

In connection with the association's scholarship fund the women's auxiliary reported a gift towards the fund of $1000 and, at the suggestion of Mrs. E. D. Hornbrook, president of the Women's National Auxiliary, it was voted to name this gift the Jeremiah Sheehan Memorial Scholarship Fund. Mrs. Hornbrook promised the delivery of $2000 additional towards the fund before the end of another year.

A resolution of unethical practice offered by the Heating and Piping Contractors Association of Kansas City was adopted.

For the Apprenticeship Committee, John A. Quinn, chairman, reported that two-thirds as many schools for apprentices were opened last year as were previously in session. A total of 128 are now being conducted. Apprenticeship instructors are being trained and foremanship training is being added to the course.

For the Standardization Committee, Thomas F. Hanley, chairman, took up in order the various projects on which this committee has been working, including the preparation of national standards and national codes. In this connection, through the service of William C. Groeniger, consulting sanitary engineer of Columbus, O., who has been acting as consulting engineer for the Standardization Committee, drawings have been made of all plumbing fixtures with a view of standardizing measurements, sizes, etc. The great variation now existing in manufacturer's measurements was brought out in the report.

The effort to develop standardized measurements, sizes, weight, etc., will undoubtedly be one of the principal objects of the committee's work during the coming year.

Another movement reported by the committee is an effort to eliminate many sizes, designs and other non-essential materials in all branches of the industry.

The question of boiler ratings, which has been before the association during the past year, was referred to the conference committee which will work with a similar committee representing the Heating and Piping Contractors National Association.

Among the exhibits of special interest to heating men were the following: Herman Nelson Corp., Moline, Ill.; Univent in operation. National Tube Co., Pittsburgh, Pa.; National pipe and nipples. Illinois Engineering Co., Chicago, Ill.; Illinois steam specialties, including Illinois heat retainer and heating boiler made by the Steel Pipe & Tank Co. of Portland, Ore. S. T. Johnson Co., Oakland, Calif.; exhibit of Johnson burners applied to Arcola heaters and industrial boilers. Hoffman Specialty Co., Waterbury, Conn.; Hoffman air valves, radiator valves, blast trap, temperature regulators, differential loop and etc.; Birchfied Boiler Co., Tacoma, Wash.; Birchfield tubular boiler.

Summer Meeting of British Heating Engineers

An exhaustive paper dealing with hot water supply installations for large infectious disease and mental hospitals, by Herbert G. Cathcart, was the principal feature of the summer meeting of the (British) Institution of Heating and Ventilating Engineers, held in Birmingham, June 22-24. A large part of Mr. Cathcart's paper was given over to statistics on the actual consumption of hot water in hospitals and asylums, including some interesting information as to where the water is used and times and quantities of draw-offs.

For the Research Committee, Chairman Edgar Herring reported considerable progress at the University College in the tests on radiators and thin building materials. The tests for heat emission from radiators, he reported, are practically complete. The figures are to be given in a forthcoming bulletin.

In connection with the tests of building materials these included experiments with two panes of glass one-sixteenth of an inch thick and set vertically in a frame. With the glass just touching, the mean of five experiments was as follows: Temperature of air on exposed side, 65° F.; temperature of air on enclosed side, 110° F.; mean over-all transmission coefficient, K. 0.74.

The panes were then separated and placed three-eights of an inch between the glass. This gave the following results: Temperature of air on exposed side, 65° F.; temperature of air on enclosed side, 109° F.; mean over-all transmission coefficient, K, 0.55.

Further experiments for spacings up to 1½ in. went to prove that after three-quarters of an inch was passed the variation was very small. The thermal conductivity of the glass was taken as 0.53 B.T.U.

Efforts are being made, Mr. Herring reported, to procure a fresh grant from the Government Research Department toward the college investigations.

For the Fan Standardization Committee, Walter Yates, chairman, in his report covered the work of that committee since 1922. At many of the meetings of the committee representatives have been present from the fan makers, fan users and Office of Works, the Admiralty and the National Physical Laboratory.

For the Boiler Rating Committee, W. W. Nobbs reported the conclusion of tests of a wrought-iron boiler designed for hot water supply, and the testing of a cast-iron boiler of like size, capacity and power. The results of the two tests are to be given later in a printed report.

The meeting on June 23 concluded with a dinner at Queen's Hotel, Birmingham, at which President Alcwyn A. Jones officiated as toastmaster. A feature of the entertainment program was a visit to the cocoa-packing and chocolate-making plant of Messrs. Cadbury Bros. Ltd., at Bourneville, where the factory buildings occupy a site of 40 acres. Much interest was shown in the lighting, heating and ventilation of the factory which are on an elaborate scale to conform with modern hygienic ideals.

Model American Home, to Be Erected in France

A model American home of ten rooms and three baths, built and completely furnished in New York, will be shipped to France and set up in the Grand Palais, at Paris, as a part of the American section of the International Exhibition of Household and Labor-saving Devices, to be held October 22 to November 15.

The house will be heated by an automatic gas-fired boiler, operated under thermostatic control, which has been contributed by the American Radiator Company; a 66-gal. automatic storage water heater, contributed by the Cleveland Heater Company, and two radiant fire heaters, one for the living room and another for the dining room, contributed by the General Gas Light Company. It is interesting to note that the radiation will be of the Corto type, which was designed by a Frenchman.

Ground has already been broken for this house, which will be erected in the new municipal park near the Brooklyn Museum, in Brooklyn, by Louis Bossert & Son, of New York. It is expected that it will be completed by August 12, after which it will be open to the public for about a month before being taken down in sections and shipped to France.

The decision to send a model American home to France was made as a result of the report of Albert Broisat, General Commissioner of the National

Model American Home in American Section of International Exhibition of Household and Labor-Saving Devices in Paris

Office of Industrial Research and Inventions, that French women, having heard so much of the comforts of American homes, particularly in regard to heating, plumbing and kitchen equipment, were beginning to demand the introduction of these labor-saving elements into the better class of French homes. The house will show the small American home at its best.

Proceedings of the German Heating and Ventilating Congress

UNDER the heading of Bericht über den XI. Kongress für Heizung und Lüftung, a report of the annual congress of the German Heating and Ventilating Industry held in Berlin last September, has been issued by the permanent executive committee of the congress. The report contains 420 printed pages with 199 illustrations and three charts. The various subjects discussed give a comprehensive idea of what is going on in the heating and ventilating field in German-speaking Europe.

All of the papers and discussions at the congress are given in full. A glance at the contents shows the emphasis continually being placed upon methods of saving fuel. One outcome of this effort is presented in the figures for fuel consumption in Germany which are about 0.6 to 0.75 tons per capita, as compared with 1.0 to 1.2 tons per capita in the United States. The percentage of fuel for heating use in Germany is about 15% of the total used for the same purpose in the United States.

Among the other topics discussed by the congress and reported in the proceedings, which are of especial interest to American engineers, are the following:

Heat Transmission through Building Construction and from Cast-Iron Radiators. New extensive investigations conducted by the German National Home of Research on insulating materials are reported. The report states that heat transmission through walls is so well established as to offer the heating engineer an accurate basis upon which to figure his installations. The heat requirements of intermittently heated buildings are given, together with practical means for determining these heat requirements. Data are given on the heat transmission of cast-iron radiators due to varying temperature differences (these results were compared with American practice in THE HEATING AND VENTILATING MAGAZINE for June, 1925). One result of these tests, not generally known, is that the heat transmission from radiators is comparatively higher in small rooms than in large ones.

Manufactured gas for heating buildings. More and more attention is being given to this subject due to the convenience of gas as a fuel, and due to the national fuel conservation policy which attained considerable strength during and after the World War. Undoubtedly the maximum value of coal is obtained by splitting it up, first into coke and gas, and then by making use of the valuable by-products. But the practice is not yet generally followed in Europe. Gas-fuel in Berlin is still five times as expensive as coal, whereas in Vienna the cost is nearly equal. In Austria new devices for burning gas have been developed, including panel heating with gas. Also the old tile stove, with its agreeable heating effect, has been adapted for use with gas, by installing vertical registers inside the stove through the flue-gas travels.

Fig 3. Battery of Wima Heaters with Capacity of 1,500,000 B.T.U. per Hour

Waste Heat Utilization. This seems to be highly developed in Europe, due to the relatively high coal prices. Data are given in the Proceedings on how much waste heat may be recovered from such sources as industrial furnaces, internal combustion engines, steam engines, etc. One of the examples reported is the utilization of waste heat from a 50,000 H.P. gas motor plant for generating steam to drive a 10,000 H.P. steam turbine.

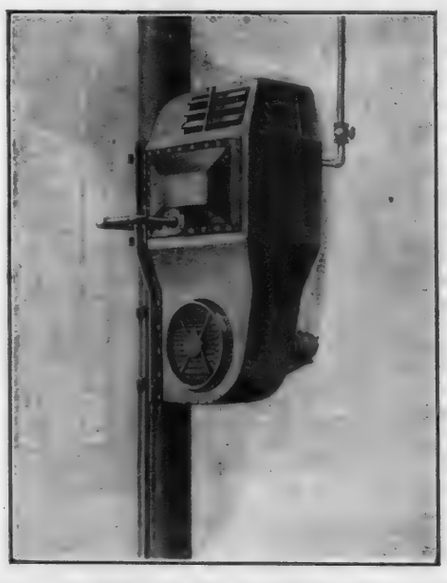


Fig. 1. Wima Recirculating Unit Heater Installed on on an Inside Pillar

Fig. 2. Wima Unit Heater Installed on an Outside Wall, Heating Fresh or Recirculated Air

District Heating. Whereas in America district heating has been developed chiefly as a central station steam generating proposition, the plants in Europe are waste heat plants, in the first place, using the exhaust from steam power plants. The heating plants thus assume more or less the functions of condensers; even a vacuum is carried in the steam mains in certain cases.

Electric Heating. This has its special field in Switzerland, in the "country of the white coal," where abundant water power sources are available and where, therefore, appliances for heating with electricity have been developed during the past few years. Illustrations are given of low-tension apparatus for heating residences, churches, etc., as well as of high-tension apparatus, running up to 5,000 K.W. with 16,000 volts, A.C.

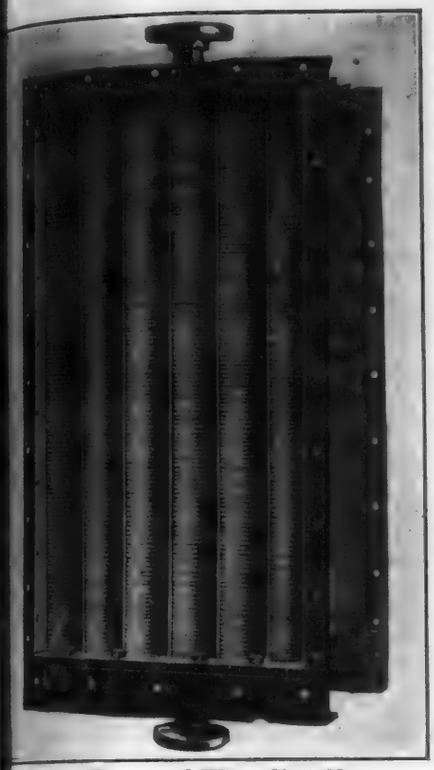
Ventilation. The report of the New York State Commission on Ventilation is looked upon by the congress as the first authoritative statement of facts on ventilating practice, a subject hitherto filled with uncertainties. According to the Proceedings of the congress, Europe is indebted to the United States for carrying through these tests with material means hardly available over there.

A number of other subjects for discussion include those on the character and properties of German fuel for heating purposes, comparative tests of metallic filters of different construction for cleaning air, different welding processes used in Germany and notes on how small residences should be built for fuel economy.

WILLIAM SOMMER.

Unit Heater Development in Europe

The trend of development in nearly every field of machine construction is towards high speed and better utilization of material. The analogy in the



Heating Element of Wima Unit Heater

heating field is the trend towards high heat transmission of modern heating units. It is along this line that German manufacturers are developing their heating devices.

The number of heating units for a given floor space can hardly be diminished without causing undesirable air current within the heated room, because the radius of action, which is said to be up to 105 ft., cannot be increased materially. Smaller heating surfaces, however, can be adopted through the use of high velocities through the heater elements and by using thin surfaces of high conductivity.

In the accompanying illustrations of the Wima unit heater, made by a Leipzig concern, Fig 1 shows a re-circulating type installed on an inside pillar, whereas the heater in Fig. 2 is installed on an outside wall, and is arranged to heat fresh outdoor air or re-circulated air. Fig. 3 shows a battery of Wima heaters as installed to furnish an output of some 1,500,000 B.T.U. per hour.

Hot Water Supply for 400 Houses

A central domestic water heating plant designed to supply 400 dwellings is a feature of the building scheme carried out by the Conisborough Housing Association, Ltd., at North Rotherham, England. In a description of this equipment, furnished us by Secretary H. L. Smethurst of the association, he states:

"Our domestic water, obtained from a deep borehole, is of excellent quality, but extremely hard. This, as you will imagine, has a serious effect on the usual water box behind the kitchen fire and on the return pipes leading from same. The repair and upkeep is very considerable, and as our tenants are chiefly colliers, having cheap coal, it means the greater the fire and heating the sooner the boiler, etc., furrs up.

"We, therefore, devised the idea of installing two large Lancashire boilers, each 30 ft. x 8 ft., located in a central position, from which are carried wrought iron galvanized pipes of 4 in. and less diameter, according to the length of the circuit. The pipes are laid underground where they cross the streets, and through the houses, which are built in pairs in respective avenues. From these mains run the smaller branches to draw-off taps.

"The result, therefore, is a service of hot water at any time, day or night, available for baths at whatever shift the men return from, besides the many uses required by the housewife. There are many other advantages of which you will be quite aware: coal, cleanliness, etc. The boilers will be worked singly, the second boiler being held as a spare. In this way each boiler may be readily cleaned of any deposit."

Recent Developments in Unit Gas Heaters

In Europe the tile stove is one of the oldest heating devices and it is still in favor for small residences and apartments. Its advantage lies in the large heating surface at a low temperature providing a very agreeable heating effect. In Vienna, where the gas prices are exceptionally favorable, a type of tile stove has been re-constructed and equipped with modern means for burning gas.

The accompanying illustrations show how the flue gases travel from the

Unit Gas Heater Developed from European Tile Stove

Unit Gas Heater with Tile Front Removed, Showing Gas Flues

burner upward through pipe registers and those heating the tile covered front. Sheets of asbestos protects the back against excessive heating loss. Air registers at the top and bottom, with an interconnection in the back permitting additional air to be heated by convection. Note the position of the heater in the corner of the room.—*Abstracted from an article by Professor Strache of Vienna in Gesundheits Ingenieur.*

How Universal Unit Ventilators Are Made

As was reported last month, in connection with the mid-summer meeting of the American Society of Heating and Ventilating Engineers in Atlantic City, one of the interesting events was a visit to the plant of John J. Nesbitt, Inc., where an inspection was made of the manufacturing processes employed in the construction of Universal unit ventilators. The greater part of one afternoon was spent viewing the various processes of manufacture, including the handling of the raw furniture steel stock, through the cutting, stamping, bending and welding operations. The visitors were then taken through the parts and patterns store-room and tool-room, and were made familiar with the various ways of handling and filing patterns, tools and gauges of a variety of shapes and sizes.

The next point visited was the assembly room where a study was made of the method used of the process of assembly. From there the visitors were taken to the finishing department where they viewed the operations of rubbing, spraying and baking the enameled finish. The next section visited was the crating and shipping department.

In the electrical department the visitors were shown the operations of assembling and testing the motor of the fan unit, as well as the making of the

switchboard equipment. Much interest was manifested in the testing department where one of the unit ventilators was being tested for temperature rise, air volumes and electric current consumption.

The party proceeded through the office to the display room where the various types of units manufactured were on exhibition. The design, construction and operation of the equipment were here explained and demonstrated by means of disassembling and reassembling, including the hand operation and the automatic operation of the by-pass and intake dampers, as well as the operation and location of the radiators and air filters.

Better Building Registry and and What It Means

IN the opinion of many responsible elements in the building industry the time has come when companies which furnish vast sums of money for building loans shall insist upon inspections and certification which will protect the lenders of money from poor building and the public from inevitable results of unsound construction.

As a practical step towards this end, an organization has been formed in Chicago, known as Better Building Registry, with headquarters at 818 Consumers Building. Better Building Registry is a not-for-profit corporation. It was completed and operations were started on a national scale last January. The purposes of Better Building Registry are defined as:

To improve construction standard of homes and other buildings, old and new, in the United States, by various educational activities, to-wit: (1) By surveys and research in respect to materials used and workmanship in buildings, particularly as both affect the comfort, the fuel economy, depreciation rate and permanence and the values of mortgages, bonds and property resulting therefrom. (2) By recording as a registry thereof the reports of surveys, inspections and research conducted and the data obtained thereby. (3) To certify to the Registry records of such surveys, inspections and research and data thereby secured. (4) To publish the results of educational research and surveys and to certify to ratings of homes and other buildings. (5) To do and perform any and all things necessary, proper and lawful to carry out the purposes for which this corporation is formed.

In other words, one of the principal functions of Better Building Registry will be the establishment, in the best possible manner and with the fullest possible recognition, of an agency by which builders may be given a certificate which has a substantial re-sale value and thus be a monetary encouragement to good building in competition with poor building, which at present goes unchecked as to financing and general practice. The certificate contemplated will be on the basis of fuel cost and depreciation rate by impartial appraisal and inspections. The inspections will include conservation of fuel by proper pipe covering, also proper wall, ceiling and roof materials and due attention to window caulking and tightening.

It is pointed out that the present situation in speculative building is that many families are being induced to buy property through "own-your-home" campaigns which are bound to have a high depreciation, as well as a high operating cost, resulting in a loss to people who can least afford it, which, in time, will run into tremendous sums of money.

With the plan of Better Building in operation the value of buildings would depend upon the fuel-cost ratings of such buildings.

Among the committees of Better Building Registry, which are already functioning is one in charge of subjects relating to heating and ventilation. It is known as the Heat Transmission Committee and the chairman is W. F. Holtman, appointed as a representative of the American Society of Heating and Ventilating Engineers. Among the other members of this committee are Earle Shultz, president of the National District Heating Association; Harold Almert, president of the American Association of Engineers; A. B. Martin, of the Boiler Manufacturers' Association; J. C. Peebles, of the Armours Institute of Technology, and H. W. Whitten, of the Chamberlin Metal Weather Strip Company of Detroit.

Among the particular subjects that will be handled by this committee are heat stop materials (insulations), asbestos pipe coverings, weather strips, storm windows, automatic damper regulators, humidifiers and electric fans.

Practical measures to make its work effective are outlined as follows:

From an engineering standpoint, appraisals of "heatability" of buildings and depreciation rates. Also certifying to records (made from actual inspection) as to materials, equipment and workmanship in buildings, with ratings given as to ten-year costs to show improvement upon super-wasteful types of similar buildings, this improvement being in terms of dollars for a premium value to better building.

From a publicity standpoint, Better Building Registry will function to furnish manufacturers with data, bulletins, etc., to enable dealers to "broadcast" information to their customers and prospects as to value and ways of better building, from the standpoint of low fuel costs and low depreciation rates. The bureau will also promote the public demand for information regarding fuel costs of home or other buildings to be bought, or of fuel costs of buildings mortgaged as security for building bonds offered to investors.

Modernizing the Cellar

A movement designed to rescue the long suffering cellar from its place of darkness and neglect has been inaugurated by the American Radiator Company in co-operation with *Architectural Forum*. The movement has taken the form of an "Ideal Cellar Competition," open to architects and draftsmen and carrying cash prizes of $4,200.

In the first place, states the announcement of the competition, while the owner's investment in the cellar is proportionally equal to that in the principal rooms the return upon that investment in realty valuation, in rental valuation and in living comfort is entirely disproportionate. This is due to the fact that fixed habit has long overlooked the possibility of developing the cellar in full measure as useful or livable space.

At the same time, every architect and home builder knows that in estimating the cost of a new dwelling, the cubic foot measurement is applied to the entire cellar with a cost factor equal to that of any other part of the building.

Another step in modernizing the cellar is to be a recognition by the architectural profession of the possibilities of designing and planning the cellar of the average American home of eight rooms or more in such a manner that the cellar space will be provided with a series of practical utility features and one or more interesting, livable rooms which will add to the living comfort and realty value of residential properties. The purpose of the Ideal Cellar Competition is to place the problem of cellar planning and design before the architectural profession in the interesting form of suggestions which will indicate in a practical manner the arrangement of cellar space that can be made to provide a direct return and to establish a capital valuation which will be clearly recognized in residential real estate transactions of the future.

What must naturally follow this valuable economic contribution by the architectural profession, it is hoped, will be the general acceptance of this idea of the improved cellar, and its recognition by owners, builders and those who sell, rent or finance homes. Over $2,000,000,000, says the announcement, is at present invested in the cellars of existing American homes, and, at the pres-

ent rate of dwelling construction, $300,000,000 is being invested annually in cellar construction by the homebuilders of the United States. This Ideal Cellar Competition promises to exercise a new influence on this vast expenditure, which will quadruple the efficiency of the investment and aid materially in offsetting costs.

The contest is built around the Ideal Type "A" heat machine, which is specified to be included in the plans and drawings submitted in the competition.

There will be a grand prize of $1,000, and a number of additional prizes in two classes, Class A and Class B.

Class "A" is for a house on level ground; Class "B" is for a house on sloping ground. The requirements include a perspective view of the boiler room and main room of the cellar; detailed cellar floor plan; perspective of the whole house, showing first and second floors; detail showing installations of heating plant and arrangement for concealing piping; and detail of special architectural feature of the main cellar room.

The competition closes August 25, and designs will be judged by a jury of well-known architects, selected by *Architectural Forum*. Announcement of full details of the contest and the rules governing it, have been sent to every architect's office in the United States.

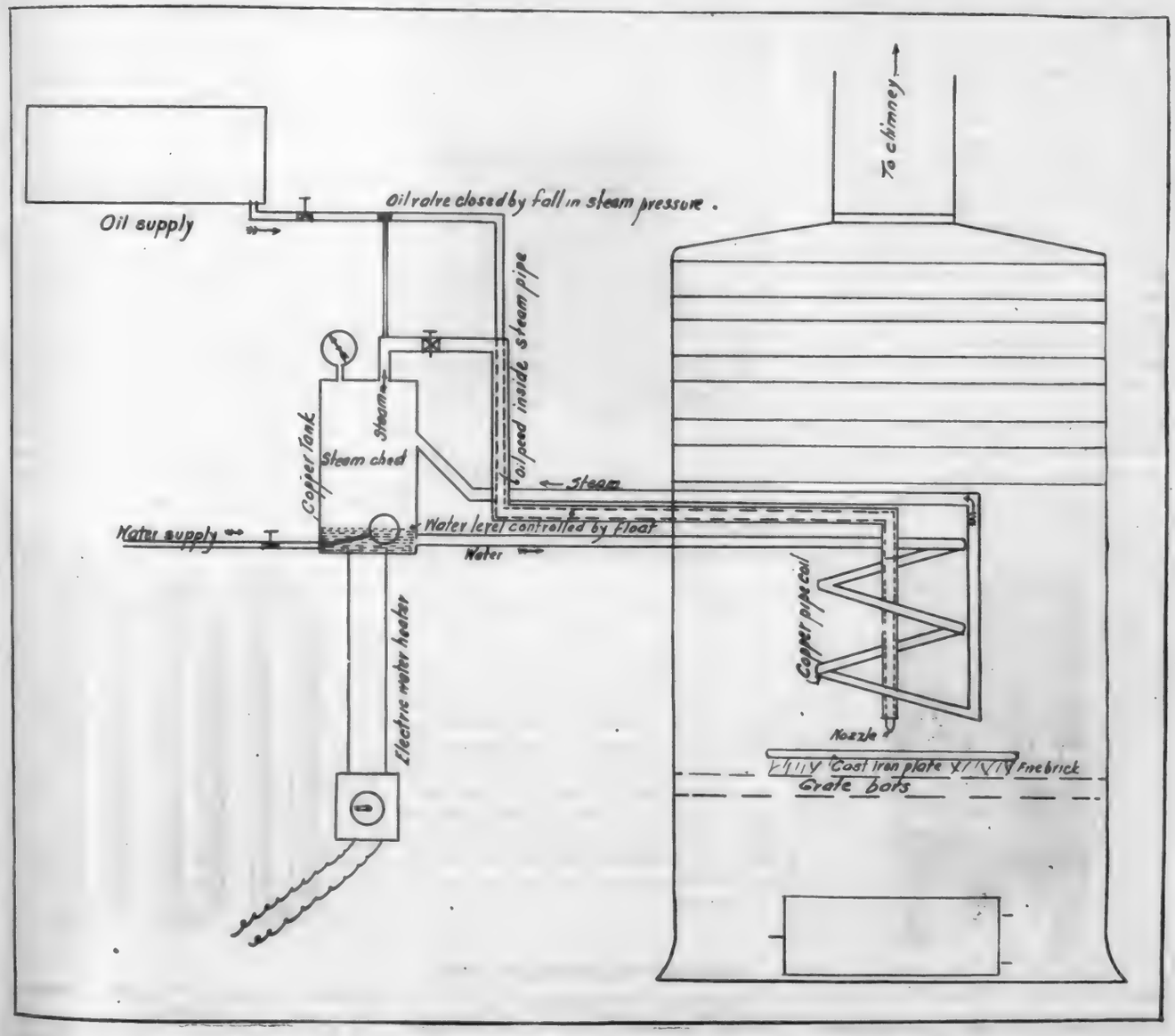
A Novel Domestic Oil Burner Developed in Canada

An oil burner combining the preheating of the oil fuel outside of the furnace, and the use of steam as an atomizing agent, has been developed by a French engineer, resident in Ottawa, Canada.

The design incorporates a small steam chest, in which an electric immersion heater heats a very small quantity of water, steam being obtained within one minute. As soon as a pressure of 15 lbs. has been reached, the steam is admitted to a jacket surrounding the oil feed pipe, the jacket terminating in an annular nozzle, surrounding the oil nozzle. The steam atomizes the oil, and a vertical jet flame is developed, which is directed downward upon a baffle plate resting on the grate bars. As soon as the burner begins to function, steam is generated in a copper pipe placed above the fuel nozzle, and this steam is used in the jacket and atomizing nozzle, the electric heater being cut off. The water level in the steam chest is maintained by a float, and automatic functioning of the burner is comparatively simple. It is understood that this burner is only in the experimental stage, but the design shows interesting possibilities.

Co-operation Needed Between Oil Burner Interests and Heating Men

While on a recent trip to Minneapolis, Homer Linn, chief engineer of the western division of the American Radiator Company, was the guest of the Twin City Oil Burner Association, at a dinner



Oil Burner Designed by Canadian Engineer to Secure Atomization by Steam

given at the Minneapolis Athletic Club. C. H. Chalmers, president of the National Association of Oil Burner Manufacturers, and Howard Cook, of Minneapolis, spoke informally.

Mr. Linn, in the course of an impromptu talk, stated that, as the result of six years of observation, no detrimental effect could be traced to the use of oil flames in cast-iron boilers. In reply to a query as to what oil burner manufacturers could best do to further progress in the industry, Mr. Linn stated, that, in his opinion, the manufacturers were making a great mistake in not properly presenting their arguments to the heating engineer and contractor, as well as to the architect, since these men were constantly being consulted by the home owner, and their reports were given the highest consideration.

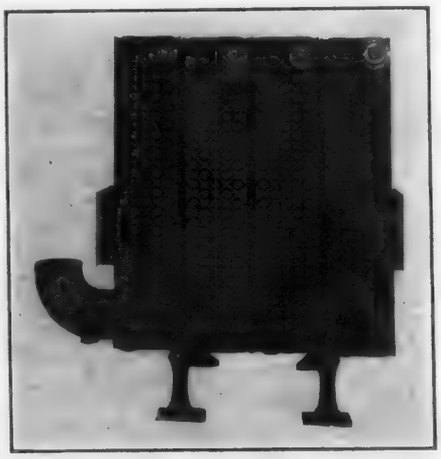
New Apparatus and Appliances

New Ideas Embodied in a Gas Furnace, Showing High Efficiency

It would seem that warm-air furnaces, gas-fired, may be made to approach perfection in efficiency, if the rapid advances in design and construction of the past few years may be taken as indicative. It is reported that approximately 90% thermal efficiency may be obtained from the latest design of the Rochester gas furnace, which is being manufactured by Clark-Cadle-Harmon Corp., Rochester, N. Y., on the basis of patents only recently issued.

The furnace consists of a central combustion chamber, of cast-iron, to which are attached, on either side, Vento radiators, or sections. The interior spaces of the Vento sections are joined, at the bottom, to a manifold located between them, and below the central combustion chamber. The patent just issued applies chiefly to the type and form of the central combustion chamber, its flues, and upper manifold.

This flue construction causes the burned gases to be drawn away from the burner box quite rapidly, actually building up a slight pressure in the upper manifold, and preventing any tendency to smother the burner, due to poor draft, or to a down draft. It is much easier for the gases, once in the upper manifold, to go down through the Vento sections to the flue manifold, than it is to buck against the strong metal convection currents in the center flues. The burners are designed to limit the amount of secondary air to the correct amount necessary for combustion, and this air is admitted only at the base of the flame ports. All of the joining of metal-to-metal parts is with screw threads, and the entire heating unit is



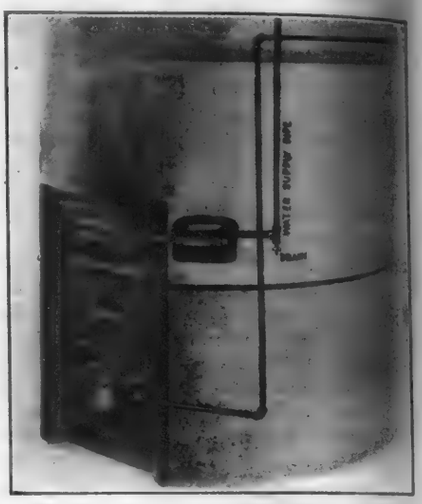
Vento Units as Used in the Rochester Gas Furnace

constructed of cast-iron. The furnace is cased with heavy galvanized-iron inner and outer walls, between which are two layers of asbestos air-cell lining. The door and door frame are of cast aluminum. When, as with this furnace, it is possible to operate at full rated capacity, with a flue temperature of 170° F., it may be seen that there has been taken from the gas flame about all of the heat it is capable of producing. It is also possible to operate with a fixed humidity of 40% to 50%, regardless of the condition of the outside air.

Assembled Rochester Gas Furnace, Without Casing

Furnace Humidifier Feed

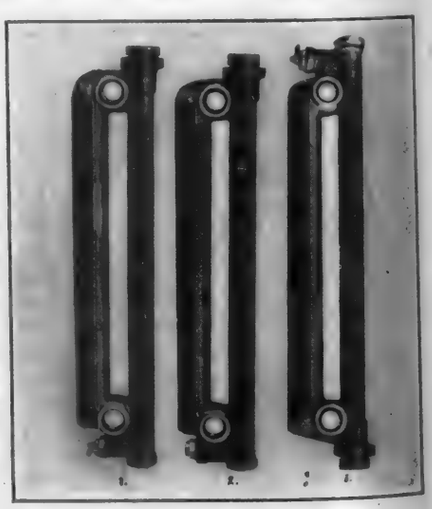
A novel type of automatic water feeder for use in connection with the evaporating pan in any warm-air furnace, has been brought out by the Heating Service & Supply Company, 169 North May Street, Chicago, Ill. It is being manufactured under the name of the Skuttle improved automatic humidifier. As will be seen from the illustration, it is connected direct with the city water supply, the flow of water being controlled by a valve and float. This device, it is stated, is capable of evaporating from 15 to 20 qts. of water a day in a frame house.



Skuttle Automatic Humidifier Feed

"Quixett" Radiator Involves Novel Features

A novel method of constructing a steam or water radiator has been patented by Frank A. Merrill of the Merrill Company, Boston, known throughout the heating industry as president of the Heating and Piping Contractors National Association. The interesting feature of Mr. Merrill's patent lies in the fact that it provides a means for eliminating all the run-outs between risers and radiators in a heating system where this radiator is employed.



Various Types of "Quixett" Radiator Sections

1—For One-pipe radiator. 2—For Two-pipe radiator return. 3—For Two-pipe radiator supply

How "Quixett" Radiator Fits Snugly in Corner of Room

The construction is simple. The rear loop of a standard two or three-column radiator is formed into a 2-in. cylinder, suitably tapped, and furnished with a slip union on one end for connecting-up purposes and to allow for expansion. This rear loop of the section or cylinder thereby becomes a part of the riser. It does not communicate with the rest of the section as is customary, but is walled off at the top and bottom so that steam or water passing through the riser is independent of the radiator. A valved inlet is provided as an integral part of the radiator section, at top or bottom of the section as required. The radiator is known as the "Quixett" (quick-set).

When used on a two-pipe job the inlet section has a valve at the top and the return section has a valve at the bottom. The valve at the top may be either hand or automatically-controlled. The valve at the bottom may be hand-controlled or fitted with a return-trap interior. Both of these valve bodies are cast as a part of the radiator section and are supplied with brass seat rings screwed into the castings. The top valve may also be of the packless or modulation type.

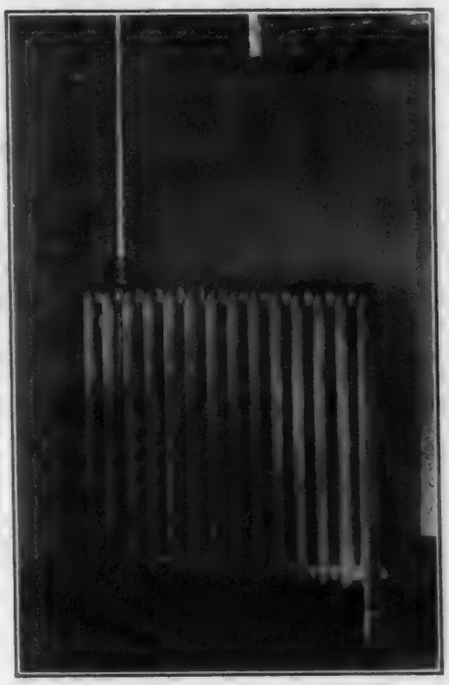
When used on a one-pipe job there is but one of these sections employed with a valve at the bottom.

As the purpose of this design is to eliminate the pipe and fittings and labor required in making the usual tie-up between radiators and risers, this radiator is particularly adaptable where the runouts would have to be under the floor, as it saves all the preliminary work in the floor construction. While this necessarily requires the risers to be exposed, they can be easily located at either end; or at the middle of the radiator (where twenty sections or less are used).

This adaptation is preferably for buildings of three or more stories where the floor space is divided the same so that radiators are located directly above one another, as in apartment houses, office buildings, hotels or garages or three stories or more. It is particularly adapted to staircases, kitchenettes or living rooms where there is not room to locate the risers at a distance from the radiator.

When the radiator is placed in the corner of the room the end of the radiator may be located within 3 in. of the wall and the riser or risers, as the case may be, will take their usual place snugly in the corner.

In installing "Quixett" radiators, the sleeves are set and plumbed, and the radiators and risers are not put in until the painting is done. Then by one operation the radiators are set in position and the riser pipes slipped in between the radiators through the sleeves.

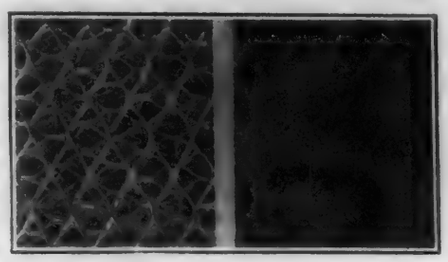


"Quixett" Connected to One-Pipe System

"Quixett" radiators are now being installed in all staircases in the fourteen-story office building known as the Charles Chauncy Building in Chauncy Street, Boston. They were manufactured by the American Radiator Company and this company has been conducting extensive tests during the past year at its Institute of Thermal Research, in Buffalo, in order to bring out the facts concerning the circulation within the radiator and air venting the same and to bring the design in keeping with the appearance and workmanship of standard radiator sections.

A Dry Air Filter Using Expanded Metal Sash

An idea of the design and construction of the Sprayco air filter, manufactured by the Spray Engineering Company, Boston, Mass., made be had from the accompanying illustrations, showing the filtering material used. This material is an expanded metal mesh arranged in several layers of decreasing opening and covered with a viscous fluid. Photographic evidence that these filters are capable of removing the dirt from the air is featured in recently-published circular matter issued by the Spray Engineering Company and devoted entirely to this new product.



"Close-up" of Spraco Dry-Air Filter Elements Clean and Dirty

A Gauge Which Indicates Temperature, Pressure and Vacuum

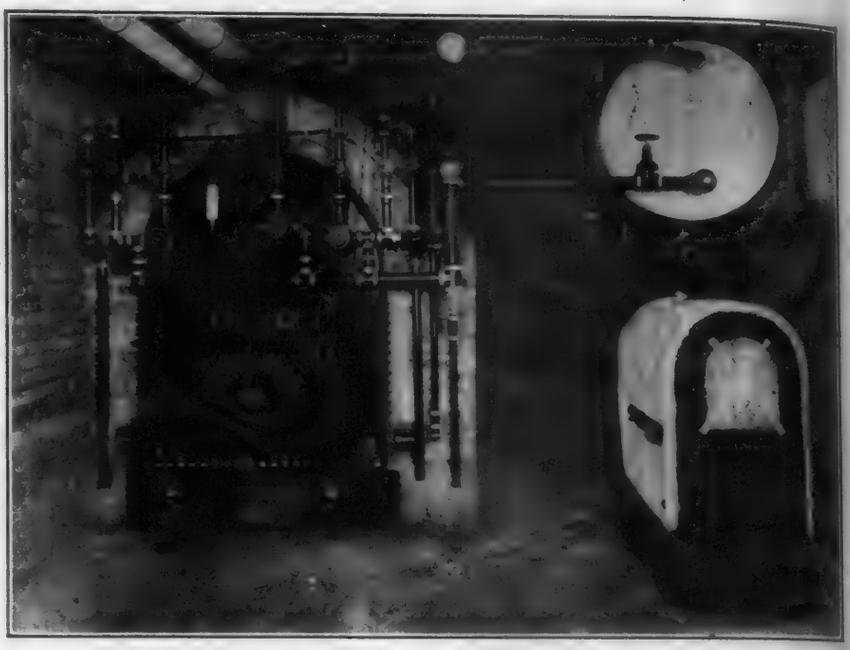
A gauge for accurately indicating temperature, pressure conditions and vacuum in inches under which a heating plant is operating, has been developed by George D. Hoffman, president of the Hoffman Specialty Company, and is being marketed by Jas. T. Marsh & Company, Chicago.

Ther-Kompo Gauge for Indicating Temperature, Pressure and Vacuum

The Ther-Kompo gauge, as it is called, measures pressures up to 30 lb., the first 5 lbs. being shown without graduation. On the vacuum side of the dial the indication is up to 30 in. vacuum, the first 10 in. being clearly shown in ½-in. graduation, with a retard from 10 in. to 30 in. The temperature range, as shown on the thermometer in the center of the dial is from 160° F. to 250°, with ample tube lengths to withstand a temperature of 274° (30 lbs. pressure) without breaking.

Since this gauge accurately indicates the temperature of the vapor, whether the system is operating under vacuum or pressure, it permits close regulation by the operator, which should result in a marked fuel economy, through efficient firing of the boiler.

It is interesting to note that no siphon or water bottle is needed to prevent direct steam contact with the Bourdon spring, the special heat treatment of the Bourdon spring preventing it from being affected by direct steam contact.



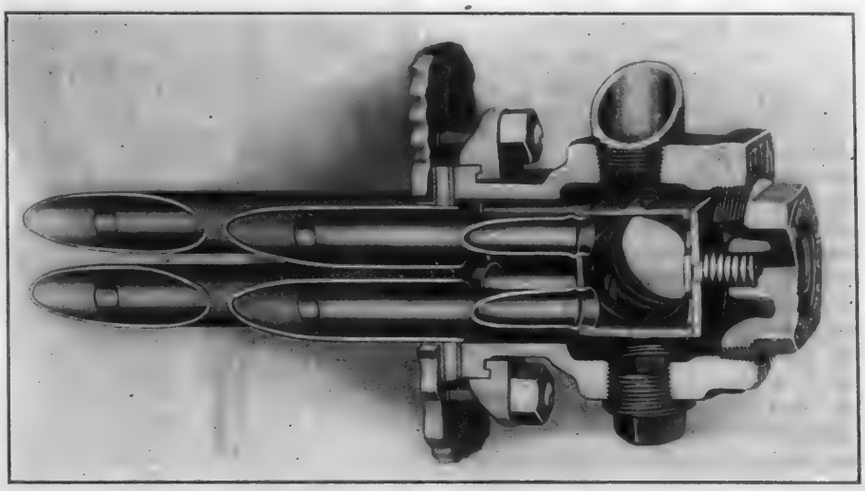
Unitem Water Heater Installed in Large House-Heating Boiler. Boiler at Right Shows Former Source of Supply

Heating Water with Water with the Unitem

It seems to be a pretty well-established fact that in apartment houses and such buildings the heating of service water in an independent water heater is accomplished with extremely low efficiency. It has been stated on good authority that from 20% to 30% of the total amount of coal used per year is required for this service. In Unitem, a heat-transfer device, brought out by Bell & Gossett, Chicago, there is placed upon the market a product with interesting features.

This apparatus is installed in the regular house-heating boiler, and, in winter operation, is used to transfer heat from the water of the boiler to the water passing through the Unitem to the house service. In the summer season, the inlet and outlet valves to the boiler are closed, and a small fire maintained on one side of the grate. This fire serves the double purpose of keeping the water in the boiler jacket hot, which, in turn, heats the service water through the Unitem, and provides for the incineration of garbage.

Unitem functions by running telescoped copper tubes into the heating boiler at the top, where the hottest water is available. Cold water from the storage tank circulates through these tubes. The water enters through the inner tubes and is heated as it passes over the submerged heating surface of the outer tubes on its return to the tank, with the result that the latter soon fills with water only a few degrees cooler than the water in the heating boiler. In a test of a Unitem-equipped boiler, with the water at 210° F., the fire was drawn, and the doors closed. Twelve hours later the temperature was 190° F. The head of the Unitem is mounted on the boiler shell, and the inner tubes are so designed and constructed that they may be withdrawn easily without dismantling the Unitem.



Cut-away View of Unitem Water Heater

Reliance Spiral Siphon Ventilator Involves New Design

The Reliance Vortex ventilator, which has been brought out by Reliance Engineering Co., 1524 Chestnut St., Philadelphia, Pa., consists of a vertical cylinder surrounded by eight tapering partitions arranged spirally on a 45° angle, having considerable length and breadth. They are enclosed by a tapered skirt or cone, arranged so that the lower ends of partitions are exposed. They taper upward to a distance above the top of cylinder thus forming eight siphons, having a greater area at the bottom and reducing considerably at the top, conforming to a nozzle.

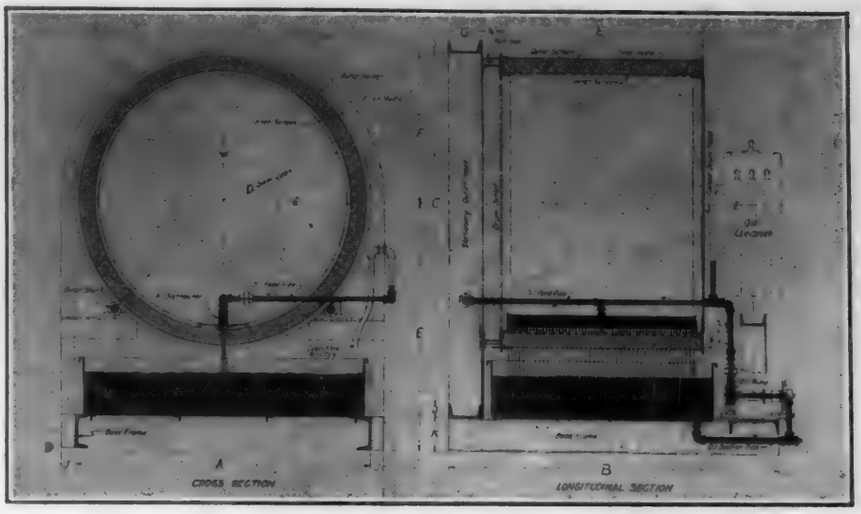
Reliance Spiral Siphon Ventilator Showing Arrangement of Vanes

The natural wind currents impinging on the lower or exposed ends of parti-

tions are directed upward in a rotary motion with violent velocity, terminating at the top in a form of vortex or vacuum core, and creating suction upward in the cylinder.

The top consists of a conical deflector with a greater diameter than the upper end of skirt and located a suitable distance above the housing, permitting of ample exhaust area for the foul air, together with the potential air admitted.

Directly under the deflector is an inverted cone the purpose of which is to intensify the whirlwind effect by harmonizing and maintaining in shape the vortex established. The Reliance is designed to be storm proof, and to prevent down drafts.



Sections of Rotary Automatic Air Filter Showing Method of Applying and Removing Viscous Oil

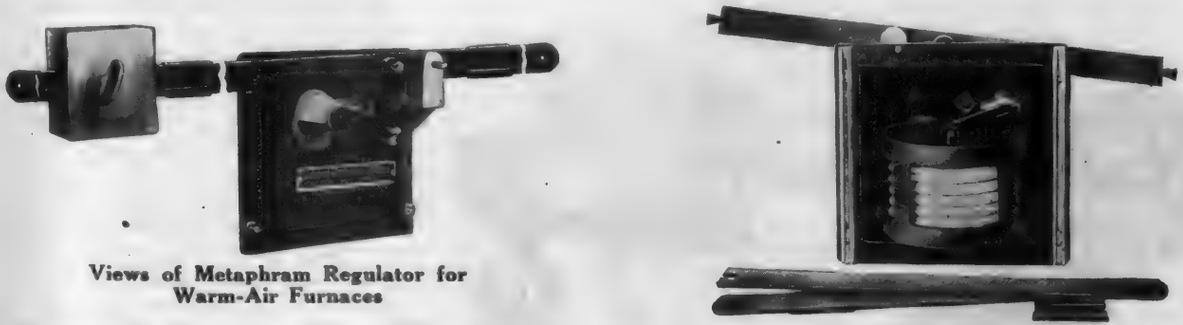
A Rotary Automatic Air Filter

In placing upon the market a new type of air filter, the National Air Filter Co., Chicago, has developed an ingenious method of attaining its goal. The filter is designed to function as an air cleaner of high efficiency, to offer a low and constant resistance to the air flow, and to function continuously, automatically, and with a minimum of expense and attention. In this device the filtering medium is mounted on the surface of a cylindrical drum, made of heavy screen. The medium itself is composed of fine ribbons of solid copper, woven into a mesh of fine texture. This fabric is wound around the drum to the desired thickness, and is held in place by an outside screen. When such a medium is kept constantly coated with fresh oil, it is practically impossible for any dirt to pass through. The air is drawn from the surrounding space through the filtering medium to the inside of the drum, and thence out through the open end to the fan. A stationary outlet is made an integral part of the filter, providing a convenient means for connection to the duct system. The viscous oil is sprayed across the inner surface of the drum, at its lowest point, by means of a distributing arrangement, and flows through the filtering medium countercurrent to the flow of air. The drum is mounted on two steel shafts, and is kept in slow rotation by means of a fractional horse-power motor, driving through a speed-reducing gear. This same motor drives a gear pump for circulating the oil. After passing through the filter, the oil falls into a reservoir. In its circuit of travel, the oil is passed through an oil filter, designed to retain all of the accumulated dirt, so that the oil used in washing will be always clean. The oil cleaner is of the conventional commercial cloth-bag type. The construction of the filter is simple, and the amount of time required for cleaning is stated to be almost negligible. The filter is made in several sizes, rated at 4,000 cu. ft. per minute to 80,000 cu. ft. per minute.

Rotary Automatic Air Filter

Metaphram Regulator for Warm-Air Furnaces

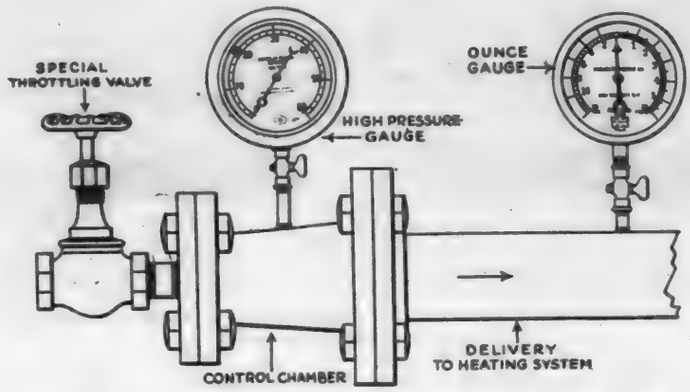
A simple, positive and inexpensive regulator for warm-air furnaces has been developed and placed upon the market by the National Regulator Co., Chicago, under the trade name "Metaphram." As the name implies, the operating portion of the apparatus is a metal diaphragm, in fact there are six cells, each containing a volatile liquid. Six small units are used instead of one large one as the combination has been found to be more effective and flexible. The damper pull is neutralized by sliding a weight along the bar of the regulator, and the position of the weight controls the degree of heat developed in the furnace. It is claimed that this mechanical device, operating without electric current, is safer than a regulator of the electric type, either using house current or dry batteries. The regulator is designed to be installed by anyone, and may be attached to the furnace in a few minutes.



Views of Metaphram Regulator for Warm-Air Furnaces

Donnelly Reducing Valve for Direct Heating Systems

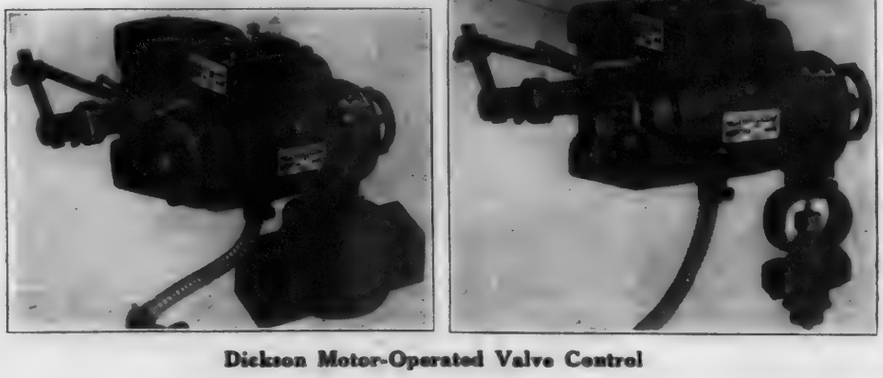
Designed to regulate the delivery of steam from a main to a heating system, and to control both the heating pressure and the quantity of steam delivered, the Donnelly reducing valve has been placed upon the market by Donnelly Systems Co., New York. The valve consists of a chamber provided with a special throttling valve on the inlet, a calibrated delivery nozzle on the outlet, and a high-pressure gauge for indicating the pressure on the control chamber. The nozzle is calibrated for the usual supply pressure. The maximum delivery pressure and quantity are obtained by adjusting the nozzle pressure to this amount. Any desired lower delivery pressure is obtained by a suitable reduction of the pressure on the chamber. There are no moving parts, and the construction and operation are simple to a degree.



Donnelly Reducing Valve Controlling Pressure and Quantity of Exhaust Steam for Heating

Motor-Operated Valves Have Interesting Features

Developed for thermostatic or remote control of fuel-oil or other liquids, the motor-operated valves developed by Dickson Industrial Equipment, of Chicago, are interesting, largely in the care that has evidently been exercised to make them simple, positive and foolproof. The power unit, which is standard for all valves, is powerful and reliable, with small current consumption. It is designed to operate direct on the power circuit, either direct or alternating current, no relay, magnet or external switch arrangement being required. By special design a low-voltage current is available for the thermostat or control circuit that will not injure the most delicate contacts through years of use. The electric motor in the unit operates a cam, through a series of enclosed gears, and is so arranged that it automatically opens and closes the valve. Closing the control circuit starts the motor which runs continuously until the actuating cam has completed one-half of a revolution, either opening or closing the valve in the line. Closing the control circuit to the other contact again starts the motor, which runs to complete the cycle of the cam. The entire mechanism is enclosed in a unit case, protecting the moving parts from dirt and injury. The valves used are of standard type, from ¼ in. to 2 in. pipe size, and may be used to control oil, steam, high-pressure gas, water, air, or any other fluid. On all units an indicating hand wheel is mounted, by which the valve may be manually controlled at any time. The cam may be designed for any reasonable time for opening or closing the valve. The standard cam performs its function in two seconds. A duplex arrangement of the motor control permits two valves to be operated simultaneously, as may be required in the gas and air supply to burners in industrial heating equipment. For a maximum-minimum fuel supply in automatic temperature control, a by-pass is provided. The same type of control operates an oil valve interlocked with an air valve, for oil-fired heating equipment.



Dickson Motor-Operated Valve Control

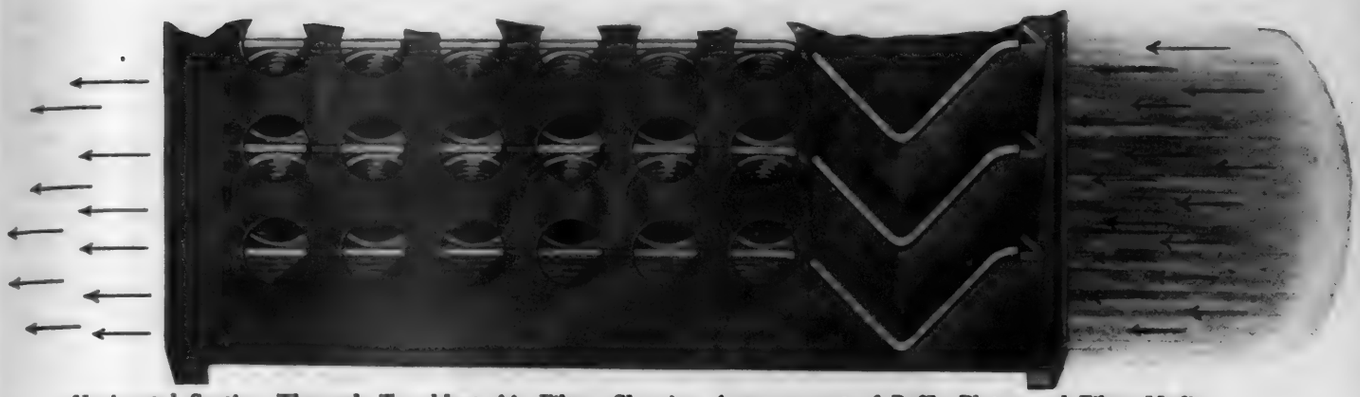
Tangldust Air Filter Uses Novel Method to Maintain Efficiency

Dividing its functions into two stages, the Tangldust air filter, manufactured by the Cooling Tower Co., New York, utilizes the first stage to gather the greater portion of the dust contents of the air on large surfaces, while the remainder of the collected dust is secured in the second stage, on a finer filter medium, composed of wire coils.

Cross Section Through Filter Cell of Tangldust Air Filter

The air, entering the filter impinges on large baffle plates, with unbroken surfaces, and the air areas are so large that continued use does not materially increase the resistance to the air flow. The air then passes between a series of wire coils, which forms a strainer, designed to remove the smaller particles of dust and dirt that have passed the baffle plates. The elements of both stages are vertical.

The filter is first placed in commission after being immersed in a special viscous liquid. Provision is made for a



Horizontal Section Through Tangldust Air Filter, Showing Arrangement of Baffle Plates and Filter Media

partial renewal of this coating by saturating, with the same oil, a felt pad so placed in the filter that it transfers oil by capillarity, to the plate and spring elements as required.

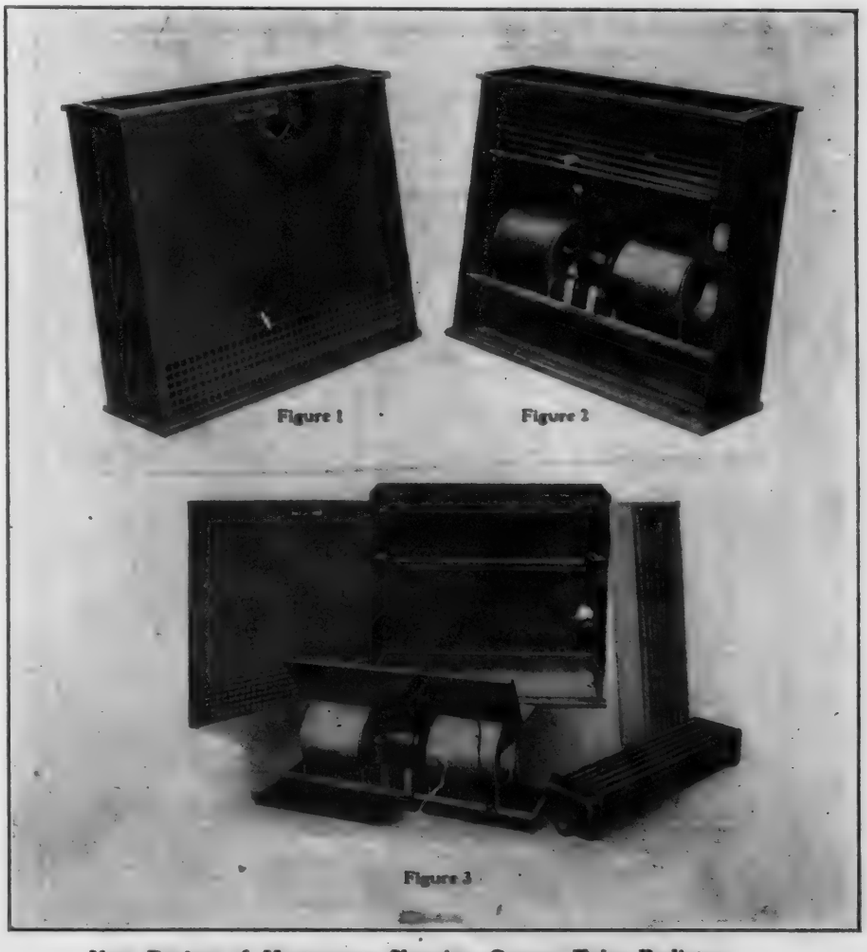
It is the purpose of the design to cause the dirt accumulation on the springs to gradually work to the bottom of the coils, preventing increased resistance to the air flow as the filter progresses in use. It is stated that the cleaning efficiency of the filter is extremely high, with low air resistance. The filters are made up in conventional units, 20 in. square, with a rated capacity of 800 cu. ft. per minute.

New Trade Publications

PAGE BOILERS are presented in a new catalog issued by the Wm. Page Boiler Company, New York. This literature describes the various lines and types of boilers manufactured by the Page Company, for steam, vapor and water heat, with either anthracite or bituminous coal or oil. The horizontal type, known as the Monarch boiler, is made in two forms, one with push-nipple connection between the sections, and the other, the header type, where each section is connected independently to a header or manifold, through the use of locknut threaded nipples. Monarch boilers are built in 26 sizes, rated, for steam, from 650 sq. ft. to 20,125 sq. ft. The Monarch smokeless boiler is constructed with air inductor so located as to deliver excess air directly over the fuel bed, where the volatile gases arising from the fire are above the combustion temperature. The resulting mixture, at the combustion temperature, is passed through the lower tier of flues to the front of the boiler, where it turns into the upper tier, and thence to the chimney. This type of boiler is built in 28 sizes from 850 sq. ft. to 11,400 sq. ft. steam capacity. The round boilers built by the Page Company are designated as Volunteer. They are designed with a deep fire-pot, which renders frequent firing unnecessary. They are rated from 250 sq. ft. to 4000 sq. ft., in 21 sizes. Full technical and dimensional data are included in the catalog. Size 8½ x 11 in. Pp. 16.

HEATOVENT SYSTEM OF UNIT HEATING AND VENTILATING is the story in the publication of the Buckeye Blower Co., Columbus, O. The new Heatovent features a copper-tube steam radiator, mixing damper and air filter, contained, with the motor and fan and regulating device, in a suitable steel cabinet. Engineering data, dimensional tables and specifications are included in the catalog, together with a full description of the features of the units. Size 8½ x 11 in. Pp. 16.

SARCO RADIATOR TRAPS is the title of a catalog issued by Sarco Company, Inc., Woolworth Building, New York, covering Sarco radiator traps for vapor, vacuum and low-pressure heating systems, packless inlet valves, Sarco No. 9 steam traps with monel metal seat, for industrial purposes, blast traps, temperature regulators and self-cleaning strainers. Size 6 x 9 in. Pp. 8.



New Design of Heatovent, Showing Copper-Tube Radiator

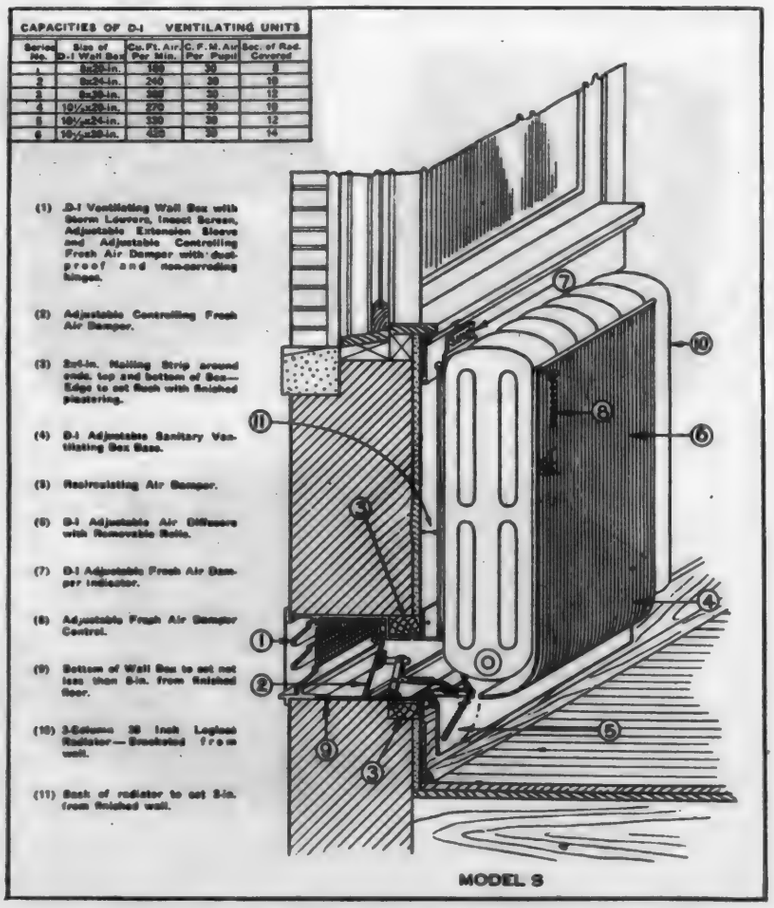
WALWORTH CATALOG No. 83 has been received from the Walworth Manufacturing Co., Boston. In this voluminous presentation of the products handled by Walworth is evidenced painstaking care to the last detail. The catalog is printed on a sepia-tint paper, in brown ink, and presents a very pleasing appearance. This combination was the result of much study to permit the use of fine type and yet reduce the eye strain to a minimum. It was adapted from the earlier utilization of sepia by the American Book Company in school books. Starting out with such care in the determination of the general make-up, it hardly seems necessary to point out that the entire catalog is carefully edited, and, while including all necessary data, has every unnecessary word deleted. The catalog, it is assumed, is available to the trade, upon proper request. Size 5½ x 7½ in. Pp. 714.

SANITARY VENTILATING UNITS FOR LEGLESS RADIATORS is a compilation of data for architects and engineers, published by C. C. Shipp & Co., Indianapolis, Ind. It covers in blueprint form the line of ventilating direct-indirect radiator units and automatic ventilators manufactured by this company, showing, schematically, the arrangement of parts, and general functioning of the units, and, in tabular form, the dimensions.

TURBINE BLOWERS is the subject of Bulletin No. 77, received from L. J. Wing Mfg. Co., New York. This is an enlargement of a former bulletin, and contains much additional information relative to the application of these blowers to stokers, and graphical representation of their use for hand-fired boilers.

ACE STEAM TRAP is featured in a catalog distributed by W. B. Connor Co., Inc., New York. In this trap a Corliss-type valve is incorporated, the use of which is designed to eliminate the troubles of the poppet-valve type of trap. The Corliss valve never leaves its seat, opening and closing the discharge port through rotation. The catalog presents all of the construction and other details, and is an effective argument for this type of trap. Size 6 x 9 in. Pp. 12.

TRANE PUMPS is the title of Bulletin No. 20, issued by Trane Co., La Crosse, Wis. This bulletin is the first of this company to conform to the new T.E.B. standard, and offers, for the first time, the complete line of Trane condensation, circulating, booster and vacuum pumps in one catalog. Each type is illustrated, and all data necessary for intelligent selection are given. Roughing-in dimensions are given, and tabulations give performances, efficiencies and other related figures. Size 8½ x 11 in. Pp. 24.


CAPACITIES OF D-I VENTILATING UNITS
Series No.
Size of D-I Wall Box
Cu. Ft. Air Per Min.
C. F. M. Air Per Pupil
Sec. of Rad. Covered
1 8x20-in. 180 30 8
2 8x24-in. 240 30 10
3 8x30-in. 300 30 12
4 10½x20-in. 270 30 10
5 10½x24-in. 330 30 12
6 10½x30-in. 420 30 14
(1) D-I Ventilating Wall Box with Storm Louvers, Insect Screen, Adjustable Extension Sleeve and Adjustable Controlling Fresh Air Damper with dust-proof and non-corroding hinges.
(2) Adjustable Controlling Fresh Air Damper.
(3) 2x4-in. Nailing Strip around ends, top and bottom of Box—Edge to set flush with finished plastering.
(4) D-I Adjustable Sanitary Ventilating Box Base.
(5) Recirculating Air Damper.
(6) D-I Adjustable Air Diffusers with Removable Rolls.
(7) D-I Adjustable Fresh Air Damper Indicator.
(8) Adjustable Fresh Air Damper Control.
(9) Bottom of Wall Box to set not less than 8-in. from finished floor.
(10) 3-Column 38 Inch Leglest Radiator—Bracketed from wall.
(11) Back of radiator to set 3-in. from finished wall.
MODEL S

Shipp Legless Radiator, Showing Air Recirculating Feature

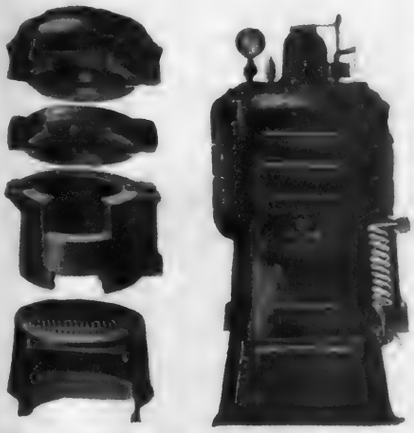
IDEAL BOILERS FOR OIL BURNING is the title of a publication now being distributed by American Radiator Co., New York. This booklet is designed to outline the application of oil burners to American Radiator Company's furnaces, and, in particular, to show the adaptability of the Type A heat machine to the use of oil. In laboratory studies of this unit, it has been determined that the conical-jet type of flame is much more satisfactory than the flat or "rose" flame, and the longer the jet the better the results. In order that the highest efficiency may be obtained, it is recommended that the jet burner be so installed that the axis of the jet is inclined upwards at half of the angle included in the jet, with the result that the lower surface of the flame, instead of sweeping downward, passes parallel to the firebox floor, and does not impinge upon it. Under these conditions, no bricking is laid on the floor, and, as the area under the combustion chamber is water-backed, it is evident that this comparatively large area becomes direct heating area, absorbing radiant heat from practically half of the surface of the flame. It is stated that, under normal good operating conditions, the efficiency of the Type A unit averages 7% higher with oil than with coal, or about 80%. It is again brought out that, where oil is used in this unit, the burner size should be a function of the radiation, and not of the boiler rating. In other words, if there is a connected load of 1000 sq. ft., such a burner should be installed as will properly burn sufficient oil to handle this load, as the boiler itself may be rated at 1500 sq. ft. or 2000 sq. ft. Evaporation should be figured at 10½ lbs. of water per pound of oil. The new oil burning Type A unit is being equipped with full-length doors, instead of an upper and a lower door, opening from the middle, and hinged at both sides. This makes it easier to install and service the gas, drip, and other pipes that may be necessary. In the oil-burning unit, the front section differs from that in the coal-burning unit, in that the horizontal water-legs are omitted, removing this surface that might come within the range of the oil flame. Of course, the regulating device is omitted where oil is used. This booklet is illustrated in color, contains sections of boilers with various types of burners fitted, many illustrations of installations and such tables of ratings and sizes as enable any oil-burner manufacturer to figure out his installation plans. Size 6 x 9 in. Pp. 36.

BARRETT PRODUCTS are pictured in a folder sent out by Barrett Sales Co., Chicago. This line consists of attaching devices for concrete, brick, marble, etc., anchors, toggles and hanger bolts. Attention is directed to the policy of the company in manufacturing these articles up to a high standard, instead of on a price basis.

THE WEATHER VEIN, Vol. 5, No. 3, issued quarterly by the Carrier Engineering Corporation, Newark, N. J., is devoted to the manufacture of Rayon, described as one of the first synthetic textiles, and to the use of manufactured weather in the company's plants. Interesting details are given of the various processes of the manufacture of Rayon, including the nitro-cellulose, the cupro-ammonium, the cellulose acetate and viscose. Due to the various chemical reactions involved in the manufacturing processes, air conditioning is of the utmost importance. Many illustrations are presented showing the Carrier installation of humidifying and dehumidifying equipment, and of the air ducts and pepper-box distributing ducts over each spinning machine. Other views show the Carrier five-step automatic heater control used in connection with the first dryer and the control instruments regulating the conditions within the equalizing zone of the finishing dryer.

YOUNG CENTRIFUGAL VACUUM AND BOILER FEED PUMP is described in Bulletin No. 5, issued by the Young Pump Co., Chicago. The bulletin covers the design, installation and operation of this pump, and furnishes all data as to sizes, measurements, etc. An insert page describes the condensation pump and receiver. Size 8½ x 11 in. Pp. 12.

ABCO 1925 ROUND BOILER is featured in a folder issued by the Abco Boiler Corp., Bush Terminal, Brooklyn. This boiler incorporates a hot-water transfer coil, of copper, which is built into the fire-



Abco 1925 Round Boiler With Integral Hot Water Transfer Coil

box section, instead of being considered an attachment. The folder lists with measurements, twelve sizes, rating from 325 sq. ft. of steam radiation to 850 sq. ft.

HEAT-O BOOSTERS designed by R. W. Menk of Chicago, and comprising an auxiliary blower for accelerating the circulation of air in warm-air furnaces, is described in a folder just issued by Heating Service & Supply Company,

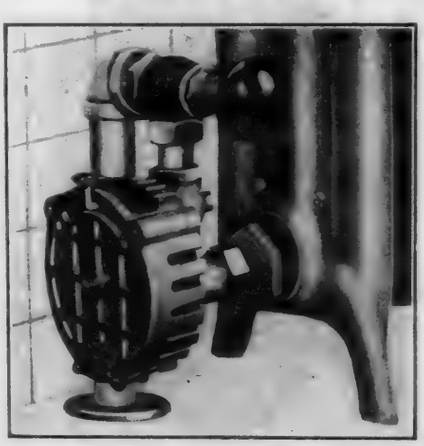
Heat-O Booster With Detail, Showing Method of Distributing Air Around Circumference of Furnace Casing

169 North May Street, Chicago, Ill. The feature of the device is a sheet-metal baffle connected directly to a blower and extending around the furnace casing. It is installed by cutting a slot in the furnace casing just large enough to admit the baffle. Cold air is drawn from out-doors or from the return-air pipes, and discharged from the nozzle of the Heat-O directly against the hottest parts of the furnace. Through the use of a fan the air flow is sufficient to overcome any resistance or cold air pressure.

IDEAL WATER-TUBE BOILER is the title of a new catalog from the press of the American Radiator Co., New York. This publication, in common with others issued by this company, is, in text, illustrations and typography, appealing to the prospective purchaser of a heating plant. It presents the essential features of the Ideal water-tube boiler, showing, in beautiful color plates, the fire-travel in the furnace and flues, and in many detail photographs, the methods of manufacture and assembly of these boilers. The method of joining sections by means of push nipples, the provision for possible enlargement of units, the duplexing of boilers, and many other points are shown and described. Emphasis is placed on the chemical and other tests that are constantly being made to assure uniformity and high class of product. Arco regulation is described, and the company's line of radiators are featured in a separate section. Several pages are devoted to illustrations of buildings heated by Arco installations, and the conventional tables giving essential data complete the catalog. Size 8½ x 11 in. Pp. 32.

UTICA-IMPERIAL BOILERS appears on the cover page of an elaborate catalog issued by the Utica Heater Co., Utica, N. Y. The subject of smoke abatement is first discussed, followed by a section on scientific combustion. The point is made that in applying the Bunsen principle to the super-smokeless boiler, the introduction of additional air to the combustion chamber will produce smokeless combustion of high efficiency. Several illustrations in color indicate the travel of the combustion gases and the effect of introducing air as it is done in the Utica boiler. The adaptability of this type of boiler to oil burners of the jet or "gun" type is also shown in color. Ratings and installation data are given in tabular and blue-print form. The sectional boilers of the same manufacture are presented in a section in the latter part of the book, as are Lincoln radiators. Size 8½ x 11 in. Pp. 36.

STERLCO SYSTEM OF VAPOR HEATING is featured in a recent bulletin issued by the Sterling Engineering Co., Milwaukee, Wis. This is a two-pipe system, incorporating the Sterlco specialties, a thermostatic trap, graduated radiator valves, vacuum air vent, and slide valve return trap. The bulletin contains essential data for calculations and for roughing-in the system. A complete typical installation is diagrammed. An accompanying bulletin on the Sterlco Roys Thermotrol describes this regulator, which is a self-contained thermostatic temperature regulator, designed for attachment to the inlet of a radiator, and



Sterlco Roys Thermotrol Attached to Radiator

the control of the room temperature by its action on this radiator. It is for use on any two-pipe system, and should not be used on one-pipe installations. Test records secured on recording thermometers are included, one record of a week showing a maximum fluctuation of less than 6°, with an outside variation of 38°. Sizes, 8½ x 11 in., Pp. 12 and 8, respectively.

STEADYING BUSINESS is a publication issued by the Policyholders' Service Bureau of the Metropolitan Life Insurance Co., New York, outlining the efforts of the bureau to reduce the seasonal peaks in various industrial activities through better co-operation in industry. Subsequent pamphlets on stabilization as applied to specific industries are now in preparation. Dr. William A. Berridge, economist, in charge of the research section of the bureau, states that more than sixty companies are contributing their experiences to this "pool of stabilization practices."

RADIANT HEATERS are described in a catalog issued by the Ideal Furnace Company, Detroit and New York. The round boilers are featured by a unique fire-pot, which has conical points projecting into the furnace, designed to keep the live coal from direct contact with the waterways. This allows a free circulation of super-heated air around the edge of the fire. It is stated that the amount of direct heating surface is exceptionally high. The square boilers are also designed with high direct-heating surface ratio. A smokeless boiler with a single grate is also listed. All necessary data are tabulated and prices given for the various sizes. A line of garbage burners, tank heaters and laundry heaters is included in the catalog. Size 4½ x 8 in. Pp. 24.

Fire-Pot of Radiant Heater Showing Projecting Conical Points

Latest Design of Venturafin Unit Heater

VENTURAFIN UNIT HEATERS are described and listed in Bulletin No. 1218, issued by the American Blower Co., Detroit. The bulletin describes the design, construction and application of these unit heaters, and, with pictures of installations and figures, carries evidence of their efficiency. The last page lists other bulletins of the special lines manufactured by the American Blower Company. Size 8½ x 11 in. Pp. 12.

WORKLESS WARMTH is the catchy title of a folder telling about the Rochester Gas Furnace, manufactured by Clark-Cadle-Harmon Corp., Rochester, N. Y., and distributed through The A. H. Wolff Gas Radiator Co., New York. This furnace embodies the use of Vento radiators, which are placed on the outside of a central combustion chamber unit, also of cast-iron. The combustion gases travel from the combustion chamber to the tops of the Vento sections, downward through the sections, and into a manifold at the bottom of the furnace. A sheet-iron shell, lined with asbestos air-cell insulation, encases the cast-iron unit.

NEW OPEN SPECIFICATIONS FOR DRY AIR FILTERS are published by the Reed Air Filter Company, Louisville, Ky., in a form complying with the A.I.A. method of filing. The specifications are based on an average operating resistance of 0.25 in. of water. In preparing these specifications the company makes the point that it is not logical to specify alone the amount of air that a filter can handle, as, of two filters of the same capacity, one might double the resistance of the other. By reducing them to a common resistance and specifying the amount of air to be handled it is claimed that conditions will be fair to all concerned. The specifications further provide for an efficiency of over 97% to be shown in the cleansing of the air passed, under all operating conditions.

ADSCO EXPANSION JOINTS are described in a folder issued by the American District Steam Co., North Tonawanda, N. Y. These joints, for high-pressure and superheated steam, have an air-cooled stuffing box, designed to insure long life to the packing, and reduce renewal costs and troubles. Size 8½ x 11 in. Pp. 4.

ATMOSPHERIC THEATRE is the title of a booklet issued by the Atmospheric Conditioning Corporation, Philadelphia, Pa. It contains a comprehensive description of the New Capitol Theatre, Chicago, one of the finest "movie" theatres in the world, with 3,000 seats, all located on the main floor and amphitheatre. A very complete heating, air-conditioning and ventilating plant is installed, which is described in the text and shown in detail illustrations.

BURN IT, is the injunction heading the story of the garbage-burning water heaters manufactured by the Herbert Boiler Co., Chicago. The four-page folder describes this and other types of boilers manufactured by the Herbert Company.

Herbert Garbage-Burning Water Heater

RADIATOR FINISHES

Effect of Different Finishes on Heat Transmission

(Concluded from Data Sheet No. 15)

HOW TEST FIGURES VARY FROM THOSE OF PREVIOUS TESTS

If bare iron be taken as the basic standard, it will be seen that the gray paint finish showed an increase of 0.6% in the amount of transmitted heat. The aluminum bronze caused a reduction of 9.9% in the amount of heat given out. These relative transmission values are different from those of the late Professor John R. Allen, which are widely published. Professor Allen's figures as commonly given are expressed as percentages in Table II.

TABLE II

Finish	Relative Transmission Per cent
White enamel	101
Bare cast iron	100
White zinc paint	101
White lead paint	98
Gold bronze	76
Aluminum bronze	74

There is a large variation between the value in Table I and that of Professor Allen for the amount of the reduction of the heat transmission caused by aluminum bronze. This is a matter of much interest as the gold and aluminum bronzes have a widespread use because of their durability.

Professor Allen's figure of 26% for the heat transmission reduction is considered much too large to be applied to the average radiator installation. It is possible that the percentage of reduction of the heat transmitted may amount to somewhere near 18% with certain types of radiators, when covered with aluminum bronze, provided that they have practically all of their surface explored for radiation. A considerable portion of the surfaces of most radiators is not covered by any finish applied with a brush. This unfinished surface in a wide column radiator may amount to a large percentage of the total surface. The uncovered black or rusty surface is more effective in transmitting heat than that finished with bronze.

Professor V. S. Day has made tests at the University of Illinois, with a specially-designed plant, to determine the emissivity of heat from various surfaces.* This heat emissivity plant employs steam-heated drums which are 10 in. in diameter and 20 in. long. The entire outside heat emitting surfaces of the drums can be finished and the air can move over the radiating surfaces freely by convection currents.

A test of the heat emissivity was made with one of these radiator drums badly rusted. This drum was then given one coat of aluminum bronze and the test repeated under the same conditions as those for the rusty drum trial. The aluminum bronze coating caused a reduction of 18.1% in the amount of transmitted heat. The entire surface of the drum was effective as a radiator with its surface entirely exposed, yet it gave a reduction 7.9% less than Professor Allen's minimum figure indicates that it should have given.

From these tests it is very evident that the application of aluminum bronze to the surfaces of radiators ordinarily used in direct steam heating will not cause a reduction of 26% or even 18% in the amount of heat transmitted by the surfaces. These percentages are too large. A reduction of 10% in the amount of transmitted heat is more nearly correct. This means that from 10% to 11% more square feet of direct radiation covered with aluminum bronze are necessary to supply a given heat loss, than would be necessary if clean radiators either fresh from the foundry, or dipped in gray paint were used without aluminum bronze.

---

* University of Illinois Engineering Experiment Station Bulletin No. 117 or 120.

RADIATOR FINISHES

Effect of Different Finishes on Heat Transmission

Changing the radiator finish will change the amount of heat that may be given off by the radiator per unit of time, other conditions being the same. Some finishes applied to the radiating surfaces will increase the amount of heat transmitted, others will reduce it. This change in the quantity of heat emitted is caused by the physical properties of the finish. The color plays only a very small part in the change and may be neglected. The effect is determined by the final texture or physical condition of the radiating surface.

Consecutive tests, with one finish after another applied to the same radiator have shown that the results for each individual finish are always the same irrespective of what the finish may have been just prior.

The number of coats applied, within reason, has no measurable effect as the last one is the effective one. There is no storage of heat in the paint, enamel, or bronze. The amount of heat given out by conduction and convection is not appreciably changed.

The radiant heat thrown off is the variable and the change is due to the texture or physical condition of the exposed radiating surfaces. Certain chemical components, such as pigments and vehicles of enamels or paints, give coatings that change the surface texture of a rough iron surface. These finishes may cause a slight increase or a slight decrease in the amount of heat transmitted as compared with that from a bare iron surface. The effect is not enough to be considered in commercial work.

Enamels and other pigments mixed with oil as a vehicle will not ordinarily withstand the temperature of steam in many installations. They discolor, blister, and peel and are unsuitable. The gold and aluminum bronzes are durable and form different surface films from those of paints or cause them to produce surfaces unsuited to the enamels. The physical properties of the bronzes cause them to produce surfaces unsuited to the emission of radiant heat. Their effect is to reduce the amount of heat transmitted.

In the accompanying data* are given the results of tests conducted at the Mechanical Engineering Laboratory at the University of Illinois to determine the effects of paint or aluminum bronze upon the amount of heat transmission of representative radiators.

Radiators tested were new and unused. They were 32 in. high, three columns wide, six sections long, and had 27 sq. ft. of radiating surface each. The tests were run under as nearly identical conditions as were possible with respect to the steam and the room temperatures. The steam temperatures ranged from 218° to 220° F., while those of the room varied from 74° to 78°. The radiators were kept in practically still air within similar booths which surrounded each of them. The only movement of air over the hot surfaces was that due to the natural convection currents of the air.

RESULTS OF TESTS

In the following tables, coefficient of heat transmission (K) is amount of heat in B.T.U. given out per square foot of radiating surface per hour per one degree temperature difference between that of the steam (ts) and that of the air (ta) surrounding the radiator. Radiation factor (R) is equal to K (ts-ta) and is the B.T.U. emitted per square foot of radiating surface per hour. Relative transmission values in per cent.

TABLE I

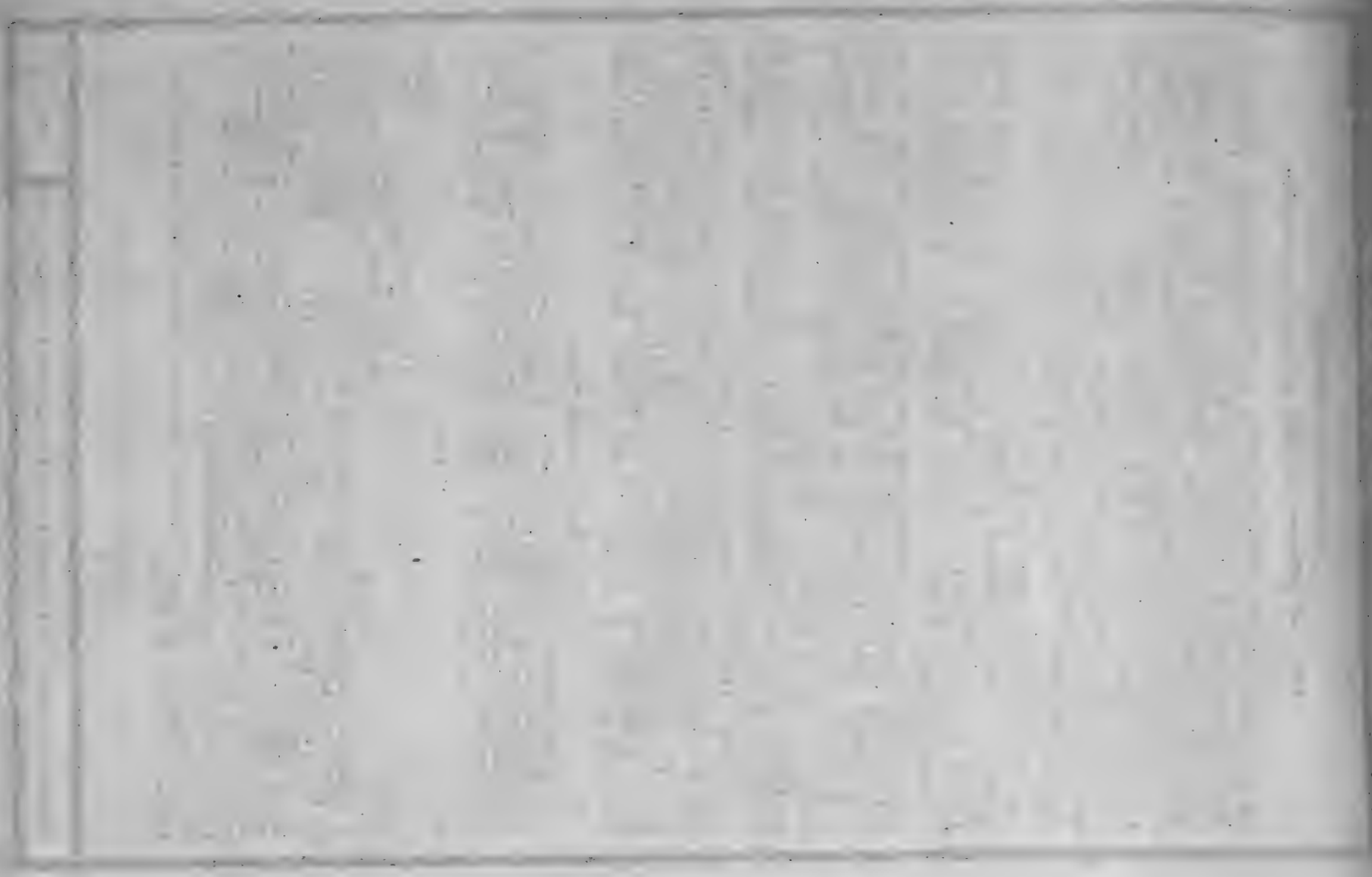
Radiator No.	Finish	Coefficient of Heat Transmission B.T.U.	Radiation Factor B.T.U.	Relative Heat Transmission Per Cent
1	Bare iron, free from rust, loose scale, and dirt	1.77	265.5	100.0
2	Aluminum bronze, one coat	1.60	240.0	90.1
3	Gray paint, dipped	1.78	267.0	100.6

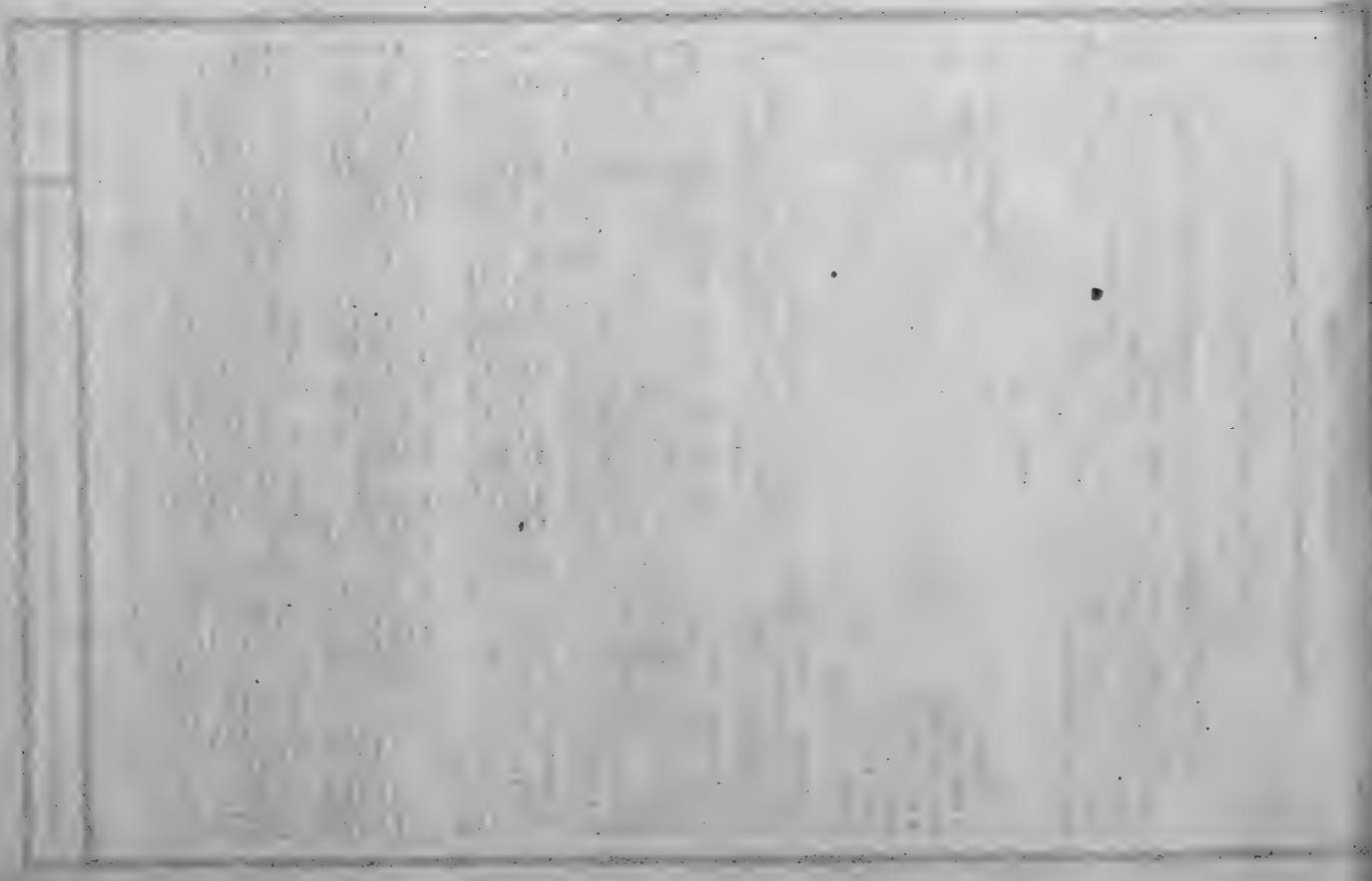
Radiator No. 2 was radiator No. 1, with the addition of one coat of aluminum bronze applied to the exposed surfaces. This radiator was painted as the ordinary radiator would be in the average installation. No attempts were made to cover the entire surface of the radiator with bronze, as this is not usually the case where radiators are painted by hand with a brush. The radiation factors given have been calculated for a temperture difference of 150° F.

---

*Compiled by William H. Severns, assistant professor of mechanical engineering, University of Illinois.

(Concluded on Data Sheet No. 15-A)





Arrangement of Drive

For the convenience of fan users, and to prevent misunderstandings which cause delays and losses the following suggestions are made for those arrangements of drive which are most often used. Reference to Arrangement 3 will be understood by all members of this Association as referring to cut and description below.

Arr. 1 **For Belt Drive**
Single fan. Wheel overhung. Includes housing, wheel, shaft, two bearings, pedestal and pulley.

Arr. 3 **For Belt Drive**
Single fan. Pulley overhung. Includes housing, wheel, shaft, two bearings and pulley.

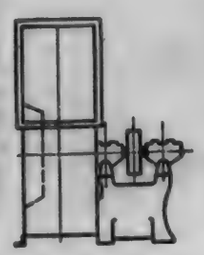
Arr. 4 **For Direct Connection**
Single fan. Includes housing, wheel and base. Wheel is overhung on engine or motor shaft.

Arr. 5 **For Direct Connection**
Single fan. Includes housing, wheel, shaft, bearing on drive side of fan, flanged coupling and base.

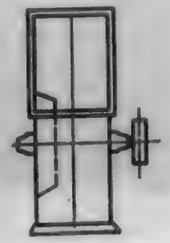
Arr. 6 **For Direct Connection**
Single fan. Includes housing, wheel, shaft, bearing in fan inlet flanged coupling and base.

Arr. 7 **For Direct Connection**
Single fan. Includes housing, wheel, shaft, two bearings, flexible coupling and base.

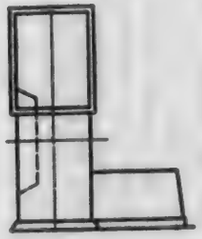
National Association of Fan Manufacturers



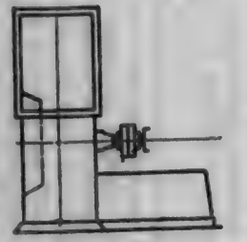
Arr. 1



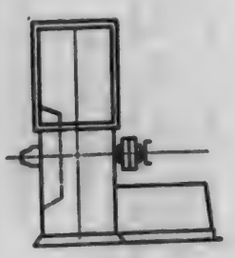
Arr. 3



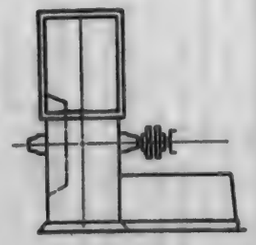
Arr. 4



Arr. 5



Arr. 6



Arr. 7

Fans—Arrangement of Drives | No. 136-A (revised)

Designation of Fans

This method of designation will apply to all centrifugal fans, single or double width, and single or double inlet. Do not use the word "hand," but specify "clockwise" or "counter-clockwise" as per titles below the cuts.

Facing the driving side of a fan, blower or blast wheel, if the proper direction of rotation is clockwise, the fan, blower or blast wheel will be designated as **clockwise.** If the proper direction of rotation is counter-clockwise, the designation will be **counter-clockwise.** (The driving side of a single inlet fan is considered to be the side opposite the inlet regardless of the actual location of the drive.)

The discharge of a fan will be determined by the direction of the line of air discharge and its relation to the fan shaft, as follows:

Bottom Horizontal—If the line of air discharge is horizontal and below the shaft.

Top Horizontal—If the line of air discharge is horizontal and above the shaft.

Up Blast—If the line of air discharge is vertically up.

Down Blast—If the line of air discharge is vertically down.

All intermediate discharges will be indicated as angular discharge as follows:—

Either top or bottom angular up discharge or top or bottom angular down discharge, the smallest angle made by the line of air discharge with the horizontal being specified (see diagrams).

National Association of Fan Manufacturers

Fig. 1
Counter-Clockwise
Top Horizontal

Fig. 2
Clockwise
Top Horizontal

Fig. 3
Clockwise
Bottom Horizontal

Fig. 4
Counter-Clockwise
Bottom Horizontal

Fig. 5
Clockwise
Up Blast

Fig. 6
Counter-Clockwise
Up Blast

Fig. 7
Counter-Clockwise
Down Blast

Fig. 8
Clockwise
Down Blast

Fig. 9
Counter-Clockwise
Top Angular Down

Fig. 10
Clockwise
Top Angular Down

Fig. 11
Clockwise
Bottom Angular Up

Fig. 12
Counter-Clockwise
Bottom Angular Up

Fig. 13
Counter-Clockwise
Top Angular Up

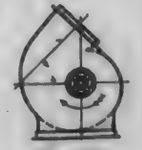
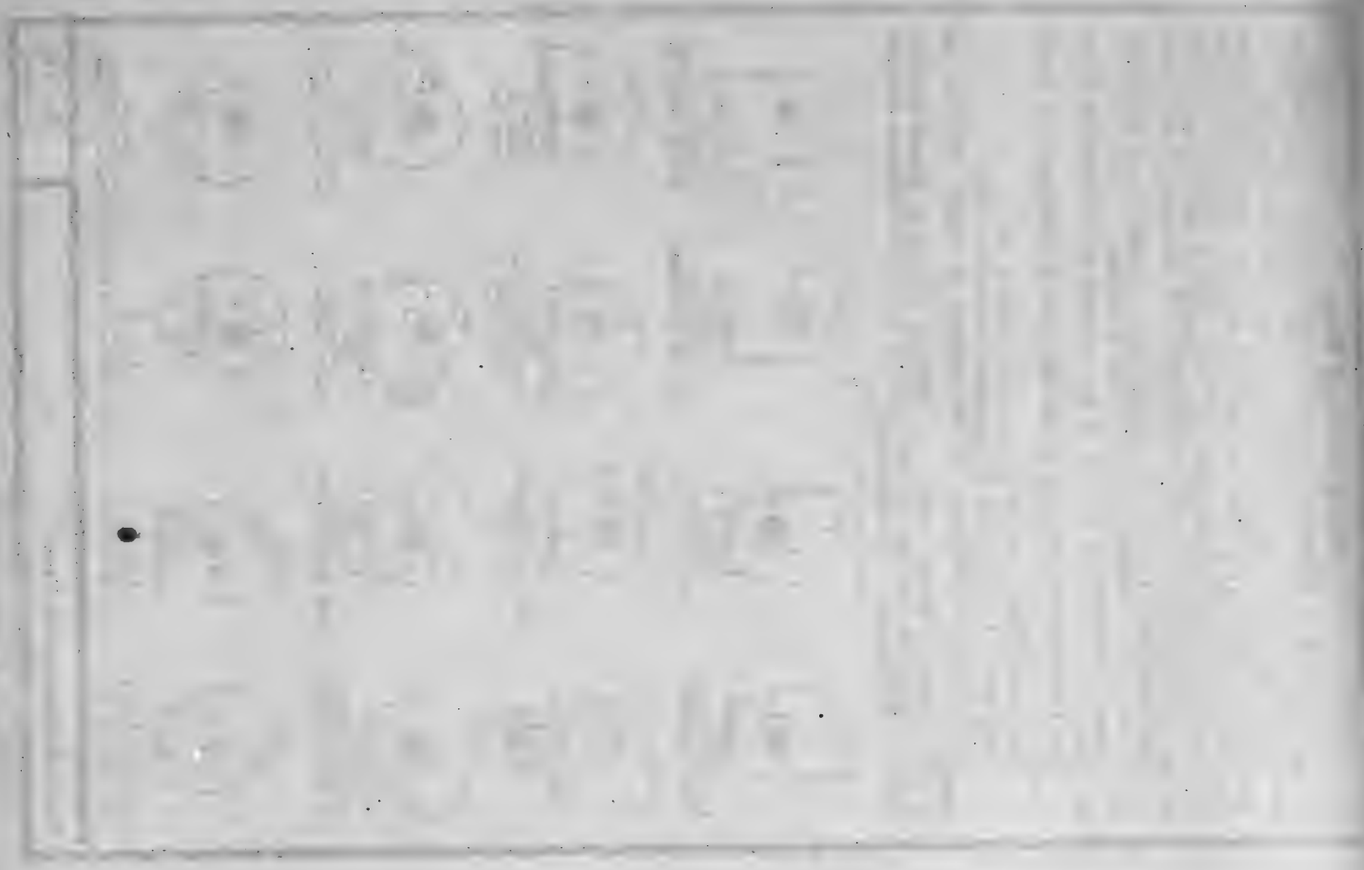


Fig. 14
Clockwise
Top Angular Up

Fig. 15
Clockwise
Bottom Angular Down

Fig. 16
Counter-Clockwise
Bottom Angular Down

Fans—Designation of Fans | No. 136 (revised)



Present Accepted Practice in Domestic Oil Burners

4. Silent Glow. *Vaporizing, Gravity Feed, Atmospheric Type.*
5. Aetna. *Atomizing, Pump Feed, Fire-Pot Type.*

4 – Silent Glow

ONE of the most interesting burners that has been developed derives its name from the fact that it functions without noise, and produces a non-incandescent flame that burns in a perforated casing, causing it to become red hot and glow when in stable operation. It is manufactured by the Silent Glow Oil Burner Corp., Hartford, Conn.

The burner is of the vaporizing type, and the flame has true Bunsen characteristics. With this type of flame, no carbon is produced, and the complete combustion that results means that practically no carbon monoxide is formed. This result is accomplished by causing the vaporized gas and air to mix at a temperature below that of ignition, in which condition the oxidation of the carbon and hydrogen in the oil-gas takes place at the same rate.

The burner consists of a series of concentric grooves, in circles or ovals, according to the shape of the fire-box. When it has been carefully leveled and made secure, it is piped to the float chamber, which is movable up and down a supporting pipe stand. The float chamber is finally set so that oil will flow into the grooves, and exactly to the level of the shoulders. When so adjusted, all valves may be left open, as it is impossible for the oil to overflow.

These grooves are formed in the base casting, as illustrated, and are V-shaped, with a shoulder on each side of the groove. They are about 3/32 in. deep. Each groove is fed with oil by a pipe entering the groove from below, with a tee in the vertical riser, a section of larger pipe below the tee serving as a trap for carbon or dirt. Three adjustable legs are provided, making it possible to secure the absolute level condition of the base casting that is required. The oil is fed through a calibrated valve, from a float-chamber, outside of the boiler, and adjustable as to height.

The burner is first set in the ash-pit of the boiler, with the casting just below the level of the removed grates.

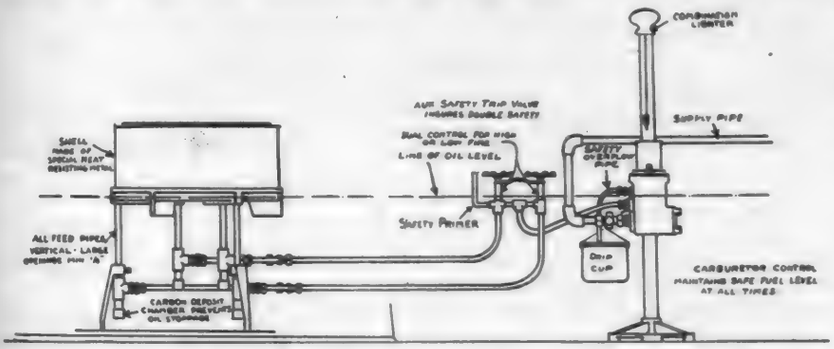
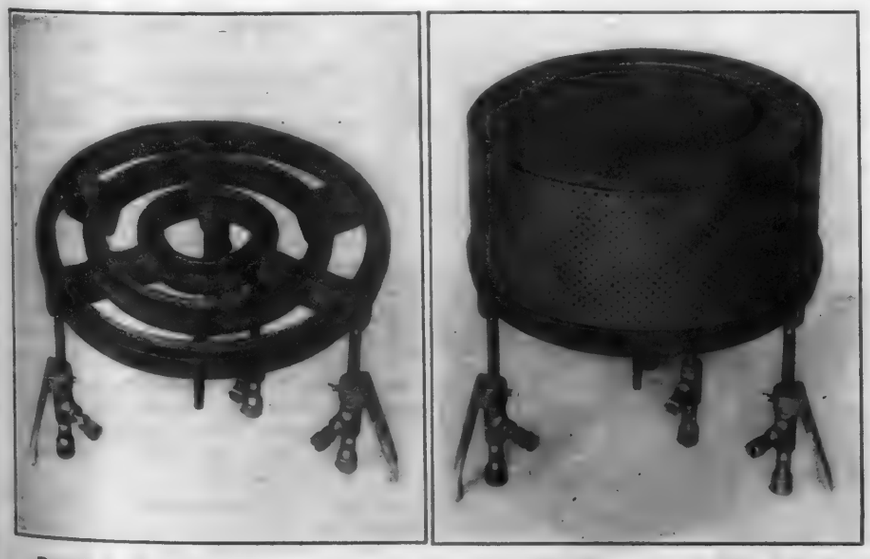

COMBUSTION LIMITER
AUX. SAFETY TRIP VALVE INSURES DOUBLE SAFETY
SUPPLY PIPE
SAFETY OVERFLOW PIPE
LINE OF OIL LEVEL
SAFETY PRIMER
DRIP CUP
CARBURETOR CONTROL MAINTAINS SAFE FUEL LEVEL AT ALL TIMES
ALL FEED PIPES VERTICAL - LARGE
CARBON DEPOSIT CHAMBER PREVENTS OIL STOPPAGE

Diagram Showing Installation Arrangement of Silent Glow Oil Burner



Detail of Silent Glow Burner Showing Base Casting Without and With Casing

On top of the casting is set the upper section, which consists of vertical perforated sheets of metal formed to surround each groove, on both sides, resting with a close fit on the shoulders. This upper section is about 8 in. high, and is fabricated from a special heat-resisting metal, the entire "nest" being securely fastened together.

The initial starting of the burner is accomplished by priming, and starting the oil burning in the grooves with a wick torch. This heats the casting, and the oil begins to gasify, rising between the perforated walls, through which air enters in such small streams as make possible thorough mixing. This forms the Bunsen flame that continues to burn, partly between the walls, and partly above, with a blue flame, and without noise. In an installation observed by the writer, noise from a burner could not be detected from a distance of a yard.

It is not intended that the burner shall operate on the "on and off" principle, and provision is made to control it from a thermostat working between high and low points, or it may be entirely controlled by hand. The burner is made in various sizes, the smallest being designed for kitchen ranges and the largest for hot water or steam boilers up to 30-in. fire-pot. Larger boilers may be fired by duplexing the burners. As the flame characteristics are similar to those of a gas burner, it is possible to operate the burner with the chimney draft almost closed, and the flame does not respond to back-drafts. It is designed to burn so-called furnace oil, and other light fuels.

5—Aetna

A forerunner of the type of atomizing burners, utilizing a large horizontal revolving atomizing plate from the periphery of which the oil is thrown by centrifugal force, is the Aetna, manufactured by Aetna Automatic Oil-Burner, Inc., Providence, R. I. This burner, in six sizes, is listed by the Underwriters to burn distillate not heavier than 35°, A.P.I., and has been approved by the Board of Standards and Appeals of New York City, for Grade A and Grade B oil.

A 1/6 H.P. to 1/3 H.P. electric motor, attached to the outer end of a heavy cast-iron bed plate, drives the atomizing plate through a horizontal shaft, bevel gears, and a hollow vertical shaft. The plate rotates at 1350 R.P.M.

SIMPLE FUEL SUPPLY SYSTEM

Fuel is taken direct from the storage tank by a gear pump mounted on the motor shaft, a by-pass permitting excess oil to be returned to the tank. A strainer is located between the pump and the tank, and another between the pump and the limiting control valve.

This valve consists of two elements. The first is set at the time of installation and places a maximum limit on the amount of fuel that may be fed to the burner, as determined by the

installation engineer. A cover to this valve is locked, so that the owner has no access to it. The second element allows the owner to set the brner at any desired point below the set maximum. In this way the owner is safeguarded against excessive flame production.

From these valves the fuel is piped directly to the nozzle, through a standpipe, extending up through the hollow shaft that carries the atomizing plate. There are two roller bearings, running under force-feed lubrication, the upper carrying the weight of the plate, and the lower acting merely as a steady bearing. Lubricating oil circulation is secured through an impeller on the lower end of the shaft. The horizontal shaft from the motor runs in a cast-iron casing, which is used as a sump for lubricating oil, and this has cpacity for an entire heating season.

DESIGN UTILIZES RADIANT HEAT TO AID COMBUSTION

The standpipe terminates in a nozzle, which is a heavy iron casting, containing a cavity with distribting pipes leading downward. When the burner is in operation this nozzle becomes hot enough appreciably to raise the temperature of the oil passing through, thus assisting atomization. The atomizing plate is a heavy steel disc, the priphery of which is toothed. The teeth are twisted from the plane of the disc, with the intent of preventing the building-up of any deposit on the plate. The Sirocco-type fan is welded to the under side of the atomizing plate, drawing its supply from the ash-pit, which action keeps the burner mechanism cool. Oil fed to the revolving atomizing plate from the nozzle is thrown from the centre in a thin film, the heat of the plate aiding in the breaking-up of the fuel. It would appear that combustion is the result of both vaporization and atomization in this burner.

The flame is thrown against a surrounding ring of fire-brick, lining a pressed steel bowl, and having a diameter approximately twice that of the atomizing plate.

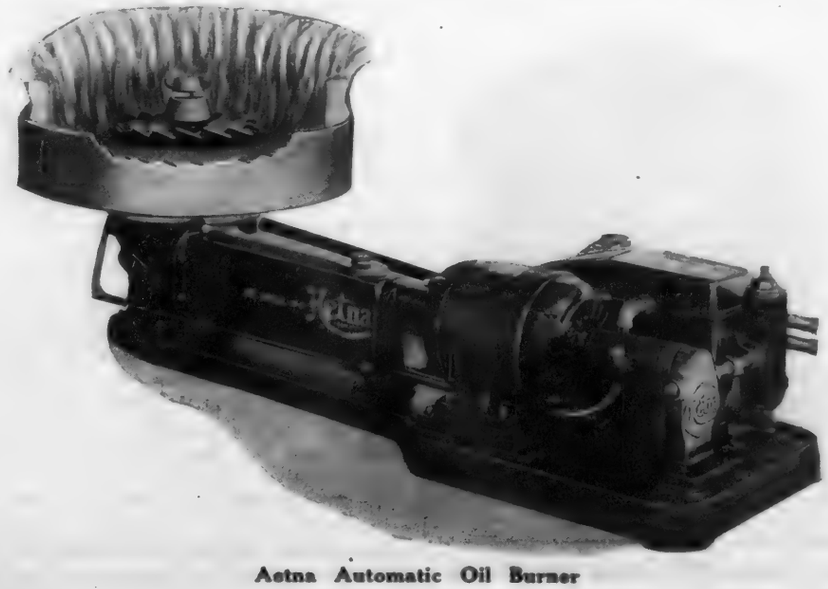
Aetna Burners in Boilers Supplying Heat to 16,000 Sq. Ft. of Radiation in Pilgrim Court Apartments, Boston

Aetna burners are built in different sizes with atomizing plates from 6 in. diameter to 16 in. The maximum fuel capacities, of course, vary with the size of the plate, and cover a range from 1 gal. per hour in the 6-in. size to 30 gal. per hour in the largest size. The rated capacities of the burners, in steam radiation are from 750 sq. ft. to 10,000 sq. ft.

SAFETY FEATURES OF BURNER

To safeguard the operation of the burner, an overflow basin is provided, into which any liquid gathering in the bowl is piped. If the pilot is not lighted, or if the gas supply is shut off, the overflow of 4 oz. of oil will automatically shut off the burner motor. The overflow basin is housed in the cast-iron casing of the control mechanism, and thus protected from accident or tampering. When the overflow basin is filled, its contents are automatically drained into a metal drawer, and the burner cannot be started until the basin is re-set by hand. If the drawer is removed for emptying, a safety switch is opened, and the burner cannot be started until the drawer has been replaced.

Thermostatic control, with a Minneapolis thermostat is used. A diaphragm or Sylphon regulator functions to prevent the burner from operating when the pressure of the steam or the temperature of the water reaches a set maximum.



Aetna Automatic Oil Burner

LARGE INSTALLATION INDICATES HIGH CAPACITY AND ECONOMY

Some interesting large installations have been made in New England, notably for heating the Pilgrim Court Apartments in Boston, and the armory of the Mounted Commands, in Providence, R. I. The former, the largest apartment building in Boston, has 115 apartments, with total radiation of 16,000 sq. ft. connected to two Capitol boilers. There is also a hot water service boiler with 1000-gal. storage. Two 16-in. Aetna burners take care of the heating load, and an 8-in. burner heats the service supply. Heat was supplied to this building during the heating season of 1924-25 with a consumption of 60,000 gal. of 28°-31° A.P.I. distillate, costing 8c per gallon, or a total of $4,800.00. It is interesting to note that the estimate for coal requirements made by the heating engineer, when the building was designed, called for 400 tons of coal, the price of which, last winter, was $15.00 per ton, or a fuel cost of $6,000.00, with an estimate for labor of $2,000.00.

The Providence armory is heated with two 16-in. burners.

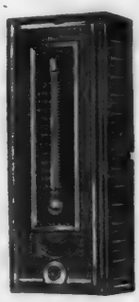
Minnesota State Capitol, St. Paul, Minn.—Cass Gilbert, Architect—W. I. Gray & Co., Heating Contractor

In Constant Service Since 1903

A POWERS System of Temperature Control

Alec Nicoll, Chief Engineer of the Minnesota State Capitol Building, says of the POWERS System of Temperature Control:

"* * * has been in constant use since 1903 * * * still working satisfactorily * * * have had very little trouble * * * still good for another long period."



The POWERS Thermostat is the secret of the accuracy, dependability and long life of the POWERS system.

This is only *one* instance of the long and satisfactory service which the POWERS System renders. Our book "The Elimination of Heat Waste," gives many more. If you haven't a copy in your library, send for one. You'll find it valuable.

(3107A)

THE POWERS REGULATOR COMPANY

34 years of specialization in temperature control

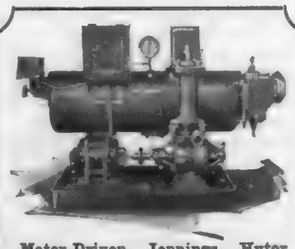
2718 Greenview Ave., Chicago

Atlanta, Baltimore, Boston, Buffalo, Butte, Mont., Charlotte, N. C., Cincinnati, Cleveland, Denver, Des Moines, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Seattle

CANADIAN OFFICES

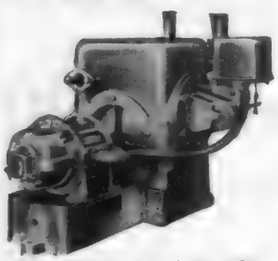
Toronto, Montreal, Halifax, Winnipeg, Calgary, Vancouver

Superiority of Jennings Heating Pumps again affirmed by test



Motor-Driven Jennings Hytor Vacuum Pump for return line heating systems, in capacities up to 300,000 sq. ft. equivalent direct radiation.

Motor-Driven Jennings Hytor Vacuum Pump, Size M, for return line heating systems having up to 5000 sq. ft. equivalent direct radiation.



Motor-Driven Jennings Hytor Condensation Pump, Unit Type, for removing condensate from steam heating systems, in capacities up to 16,000 sq. ft. equivalent direct radiation.

Here are the bulletins you should have:
Bulletin 37 Return Line Vacuum Heating Pumps.
Bulletin 29 Condensation Pumps.
Bulletin 25 Type M Return Line Vacuum Heating Pumps.
Write for them.

IN a series of tests recently conducted by the Board of Education of a middle-western city to determine the relative efficiencies of several return line vacuum heating pumps, the superiority of Jennings Hytors was again attested,—in high vacuum and large air removing capacity maintained, and in economy of power consumed.

Results such as these assure worth-while dollar and cents savings from the use of a Jennings Pump. They emphasize, as do the results of many other tests and the experience of innumerable Hytor users, that the Jennings Pump is a good dividend-paying investment. It pays for itself through the economies it effects.

Its steady and reliable performance under actual operating conditions means dependable service season after season. The Jennings Hytor has no parts likely to get out of order or require attention, repair or replacement. There is no metal-to-metal contact inside the pump, and therefore nothing to wear or cause a diminution of vacuum.

For complete facts, figures and recommendations, get in touch with our nearest sales office. Also ask for copies of Jennings Pump Bulletins.

NASH ENGINEERING COMPANY

So. Norwalk **Connecticut**

Branch Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington. In Canada: Montreal, Toronto and Vancouver. European Offices: London, England, Norman Engineering Co.; Brussels, Belgium and Amsterdam, Holland, Louis Reijners Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Hytor

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

Personals

W. L. Abbott, past-president of the Western Society of Engineers, now chief operating engineer of the Commonwealth Edison Company, Chicago, has been nominated as president of the American Society of Mechanical Engineers, which nomination usually carries with it election to the office. If elected, Mr. Abbott will be the second Chicagoan to hold this office.

A. J. Dickey, vice-president and general manager of the C. A. Dunham Company, Ltd., is in England on a combined business and pleasure trip.

H. Foster Bain has resigned as director of the U. S. Bureau of Mines to become secretary of the American Institute of Mining & Metallurgical Engineers. He will succeed F. F. Sharpless, retiring secretary. Mr. Bain was appointed director of the bureau by John Barton Payne, Secretary of the Interior under President Wilson, and continued to hold office under Secretary Fall, and the present secretary. For several months he has been on leave of absence, at the request of the Argentine government, investigating the mineral resources of that country. Mr. Bain will have headquarters in New York.

Robert L. Gifford, president of Illinois Engineering Co., Chicago, is enjoying, with his family, a vacation among the Fjords of Norway.

John Gaillard, engineer on the staff of the American Engineering Standards Committee, has returned to his duties after doing some special work in standardization for the American Radiator Company.

George W. Wood, president of the Shure-Tite Mfg. Co., Cincinnati, with Mrs. Wood, attended the convention of the National Association of Master Plumbers.

Harry E. Kerr, president of the Cleveland Gas Burner & Appliance Co., of Cleveland, O., journeyed to the Pacific Coast to attend the Master Plumbers' National Convention in Portland, Ore.

Miscellaneous Notes

Chicago Master Steam Fitters Association elected the following officers at its meeting June 23, at the Sherman House: President, F. C. Black; Vice-President, George Mehring; Secretary, Louis T. Braun; Treasurer, F. W. Lamb.

Business Conditions during the months of June and July were the subject of a questionnaire sent out by the National Trade Extension Bureau. The questions covered condition of heating and plumbing business during the month of June, the outlook for heating and plumbing business during the month of July, the outlook for new building and the outlook for renovation work. The country was divided into districts. The summary of all districts was as follows:

Condition of plumbing business month of June, Reporting Good 30, Fair 65	Bad 14
Condition of heating business month of June, Reporting Good 17, Fair 57	Bad 28
Outlook for plumbing business month of July, Reporting Good 32, Fair 66	Bad 11
Outlook for heating business month of July, Reporting Good 19, Fair 69	Bad 14
Outlook for new building, Reporting Good 33, Fair 48	Bad 29
Outlook for renovation work, Reporting Good 29, Fair 55	Bad 22

AUTOVENT UNIT HEATERS
Provide Positive Heating Service

NOTE THE STURDY HEATING COILS

Autovent Unit Heaters meet a long felt need for truly efficient and economical heating of industrial plants, garages, foundries and other buildings of large area. These units are built along strict engineering lines, embodying only those features that have proved their effectiveness in heating both large and small buildings. They speed up heating and increase distribution. By controlling the heated air at its source it can be placed wherever desired and in the necessary quantities, regardless of outside temperature.

Heating and ventilating engineers are invited to write for a copy of our Engineering Data Book on these units.

AUTOVENT FAN & BLOWER CO.
730-738 W. Monroe Street
Chicago

Post Office Rulings on Catalogs, in connection with the new postal rates, is to the effect that a catalog is not a catalog when it contains less than 24 pages. The rate on catalogs is 1c per 2 oz., and on smaller publications 1½c per 2 oz. As the result of the ruling, it is reported many concerns are increasing the size of their catalogs to 24 pages. There is also found a tendency to depart from standards in the way of paper sizes, printing and folding. By attaching a circular, on which the rate is 1½c per 2 oz. if mailed alone, to a 24-page catalog the whole can be mailed at the 1c rate.

Chicago.—Unionization of all the open-shops trades which have craft organizations affiliated with the Chicago Building Trades Council with the exception of the carpenters has been effected as the result of the strike on the Central Produce Market. Following the settlement of this disturbance the teamsters union called a strike of teamsters calling some men from Bluffington which was also settled. Certain points in connection with the right of unions to engage in sympathetic strikes have been placed in the hands of Federal Judge Page for interpretation.

Roofing, Metal and Heating Engineers of Philadelphia have adopted the interesting practice in their meetings of submitting questions pertaining to the subject under discussion to the members previous to the meeting. The questions are numbered and are distributed at random. The chairman calls each number and the holder of the question is expected to respond. This method of securing data of practical value has been found successful in drawing information from those usually too reticent to "speak out in meeting."

National Trade Extension Bureau, Evansville, Ind., announces that it has available a new classified directory of master plumbers and heating contractors of the United States. This is published in the standard 8½ x 11 in. loose-leaf form, which lends itself admirably to the monthly correction service also furnished by the bureau. The directory is published for the exclusive use of supporting members. Each copy is registered, and is not transferable. The directory contains approximately 30,000 names.

Des Moines, Ia.—The Methodist Hospital in Des Moines will erect a heating plant and laundry to cost from $50,000 to $70,000.

National Metal Trades Association, Chicago branch, Charles L. Blatchford, secretary, Paul Blatchford, counselor, is now located at 224 North Clinton Street, Chicago.

Manufacturers Notes

Gorton & Lidgerwood Co., New York, announces the appointment of the A. E. Jones Company, Syracuse, as its representative in central New York. In Minneapolis the company's products are now handled by the W. P. Nevins Company, covering Minnesota, North Dakota and South Dakota. As sales agents for North Carolina and South Carolina the company has appointed the J. C. Slaughter Machinery Company of Charlotte, N. C.

Vapor Heating Co., York, Pa., announces the appointment of W. W. Birnstock as general manager and treasurer. A long experience in the heating business, particularly in the development of the Broomell system, qualifies Mr. Birnstock for his appointment as active executive of the company handling this system. Mr. Birnstock has been responsible for the design of many important heating installations carried out while he was associated with Broomell Schmidt Company, well-known heating engineers and contractors. The Vapor Heating Company also announces the appointment of O. E. Willis to be manager of the New York office. Mr. Willis has been associated with the engineering department of the company for several years.

Fulton Co., Knoxville, Tenn., has issued a booklet entitled "Important Pat-

SPRACO
AIR FILTERS

For General Ventilating Systems Are Indispensable

SPRACO Air Filter

Write for bulletin No. 81 on SPRACO AIR FILTERS

They excell because of

High Cleansing efficiency, due to the use of filter media comprising a stack of densely compacted, viscous coated, variegated expanded metal sheets with edges opposing the incoming air, presenting the largest amount of dust collecting surface in a given space.

Minimum resistance to air flow consistent with large cleansing capacity.

Progressive Filtration—filter media arranged from coarse to fine in direction of air flow.

Minimum operation and maintenance cost, no moving parts.

Cleaning and Charging Tanks will accommodate five cells at one time.

SPECIFY SPRACO AIR FILTERS AND BE ASSURED OF CLEAN AIR.

Air Coolers
Cooling Ponds
Spray Nozzles

SPRAY ENGINEERING CO.
BOSTON, MASS.

Air Washers
Strainers
Flow Meters

Johns-Manville Underground System of Insulation

The Trench. This one presented particular difficulties because of many springs and some quicksand.

Laying the underdrain in the sub-trench. One underdrain for each run of conduit.

Centering lower half of conduit after a substantial bed of gravel has been provided.

Setting roll frames in concrete piers. These frames support the piping and permit free movement in expansion.

Welding piping strengthens joints and makes them tight. After welding, pipes are thoroughly tested with water under pressure for leakage.

Tops applied. The lower half of conduit already contains Asbesto-Sponge Conduit Filling. Lower and top halves matched by number.

Asbesto-Sponge Filler being rammed in between the top and the piping. This insulation is the most efficient of its kind.

Cementing the bell joints further seals the conduit and makes it completely watertight.

Additional gravel is placed in the trench above the level of the side joints. After backfilling and grading, the system is ready for use.

THE efficiency of the Johns-Manville Underground System of Insulation for steam and hot water pipes is usually well over 90%. Hundreds of installations throughout the United States and Canada have shown the efficiency of this system to be permanent and dependable. Carefully and secured laid, these systems operate for many years with little or no maintenance expense.

JOHNS-MANVILLE INC., 292 MADISON AVENUE AT 41st STREET, NEW YORK CITY
Branches in 63 Large Cities, For CANADA: CANADIAN JOHNS-MANVILLE CO., Ltd., Toronto

Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

ent Decisions," in which are set forth recent decisions of the United States District Courts in the matter of suits against Bishop & Babcock Company, Cleveland, O., Janesville Laboratories, Inc., and Edgar L. Leach, Janesville, Wis., for infringement on patents issued to Weston M. Fulton. In each of the three cases cited, the finding of the court was that the patent was valid and had been infringed. This patent covers the flexible corrugated metal bellows manufactured by the Fulton Company.

Scott Valve Mfg. Co., Detroit, Mich., advises that H. P. Rogers and Co., Cleveland, O., has been appointed as Cleveland representative for the Scott line of bronze and iron-body valves.

Ofeldt Gas Fired Boiler Co., Nyack, N. Y., has been purchased by Wm. Kane Manufacturing Co., Philadelphia, and the name of the company has been changed to Mears-Kane-Ofeldt, Inc., with headquarters in Philadelphia. The capital stock of the new corporation has been increased to $200,000.

Bayonne Supply Co., Bayonne, N. J., lost its entire plant by fire, in June, with a loss estimated at a quarter of a million dollars. It is understood that the loss was well covered with insurance, and the company is carrying on in temporary quarters until the plant is rebuilt.

Continental Heater Corporation, Dunkirk, N. Y., has named George H. Dahm to carry out special work in connection with a sales campaign in New York territory, with headquarters in the New York office. Mr. Dahm was, for several years, with the Skinner Bros. Mfg. Co., St. Louis, and has a large acquaintance in the heating field.

Hoffmann Specialty Co., New York, reports an increase in business of 16 2/3 for the second quarter of 1925, over the corresponding period of last year.

Gorton & Lidgerwood Co., New York, announces the removal of its San Francisco office to Room 346, Rialto Building, 116 New Montgomery street. The office is in charge of Duane L. Bliss, Jr., California sales agent for the company. F. E. Witte is handling the San Francisco territory under Mr. Bliss. The San Francisco branch reports recent installations of Gorton water-turn packing-lock radiator valves in the new Pacific Telephone & Telegraph Company on New Montgomery Street, the largest building in San Francisco, in which 900 Gorton valves are being installed at the present time.

Minneapolis Heat Regulator Co., Minneapolis, Minn., held a convention of its branch office managers, salesmen and field service men at the home office at which plans were outlined for a greatly enlarged sales and advertising program. The convention was addressed by President W. R. Sweatt, H. W. Sweatt, C. B. Sweatt, and A. R. Olson and George Enzinger of the Olson & Enzinger Advertising Agency of Milwaukee.

Vapor Engineering Co., 10 South Street, Philadelphia, Pa., has been organized by J. Wilbur Glassey and Mitchell S. Buck to sell the Vapor Engineering line of heating specialties.

Republic Boiler & Radiator Co., formerly located in Washington, D. C., has moved its headquarters to Woodberry, Baltimore, Md. The company will maintain a branch office in Washington at 1214 New York Avenue, N. W. A New York office and warehouse is maintained at 110-162 Imlay Street, Brooklyn.

Combustion Specialties Corp., New York, has moved its executive offices to 60 Wall Street. The Utilization Division of the Surface Combustion Company is still located at 366 Gerard Ave., New York.

Bernhard Boiler Mfg. Co., Cleveland, O., has taken over the business of the Bernhard Boiler Co., Lima, O., and have affiliated with the Interstate Foundries, Inc., Cleveland and Chicago. The effect of this consolidation will be to place the Bernhard boilers on the market to

WHY LET THAT UNHEATED BUILDING WORRY YOU

We manufacture Unit Heaters and Fan Heating Systems for every need. If steam is not available, our all steel direct fired Fan Furnace will meet your requirments.

Send us your heating problems and we will show you the easiest and cheapest way.

Recommendations and prices furnished cheerfully without cost to you.

COMET UNIT HEATER

Suitable for use where steam and hot water is available. This Heating Ace is especially adapted where compactness and lightness in weight is of importance. For complete description write for Bulletin No. 85.

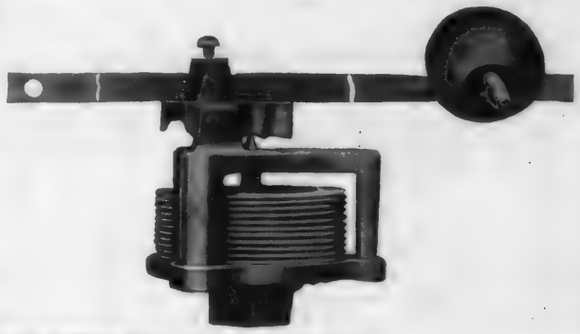
DIRECT FIRED FAN FURNACE

For use where steam or hot water is not available. For complete data write for Bulletin No. 90.

THE NEW YORK BLOWER COMPANY

CHICAGO, ILL. *Branch Offices in Principal Cities* LA PORTE, IND.

Standard Equipment on all these steam boilers.



No. 924 Sylphon Steam Damper Regulator, extra sensitive type.

No. 22 Sylphon Damper Regulator for low pressure steam boilers.

No. 45—A Hot-Water Damper Regulator.

ABENDROTH	FLORAL CITY	OIL CITY
AMES	FREED	OTIS-SAWYER-ECONOMY
BIRCHFIELD	HEGGIE-SIMPLEX	PIERCE-PEBCO
BURNHAM	KEYSCO	RICHARDSON
COIL	KEYSTONE	ROSS
COATESVILLE	KEWANEE	STAR
ECONOMY	L-O	THATCHER
FITZGIBBONS-ONTARIO	NOVELTY	WEST COAST
	NATIONAL	

Bought as Trimmings—

yet they add a mighty important part to each Boiler's performance.

THE 26 leading manufacturers who have standardized on equipping their boilers with Sylphon Damper Regulators feel safe about the *minimum* consumption of coal, because Sylphon Damper Regulators use (and no others can) the famous one-piece, flexible, seamless, solderless Sylphon bellows as their diaphragm. This bellows, sensitive to the slightest variation in steam pressure or water temperature, powerful and free in its movement, *guarantees* an everlastingly accurate opening and closing of damper drafts. This unfailing action insures the feeding of the maximum of air to burn the minimum of coal, obviates over- or under-heating, and prevents the necessity of running up and down stairs to adjust drafts.

Made in standard iron pipe sizes.
May be specified and used on any make of boiler.

Ask for Bulletin WDR-5

This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL, SEAMLESS SYLPHON BELLOWS
Sylphon

THE FULTON COMPANY

KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

Sales Offices in: New York, Chicago, Detroit, Boston, Philadelphia, and all the principal cities in U. S.

European Representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley Street, London, W.1, England.

Canadian Representatives: Darling Brothers, Ltd., 130 Prince Street, Montreal, Canada.

much better advantage than has previously been possible.

Minneapolis Heat Regulator Co., Minneapolis, has opened a branch office in Boston, with George Kingsland, formerly of the St. Louis office, in charge.

Even-Heat Manufacturing Co., Chicago, has opened new showroom and sales office at 207 West Lake Street.

A. W. Cash Co., Decatur, Ill., has appointed the Advance Engineering Company, New York, to represent it in that territory. Robert Bristow, previously with the Paulsen Spence Company, which heretofore represented the A. W. Cash Company, will be in charge of this department.

Reed Air Filter Co., Louisville, Ky., reports the following installations of Reed filters, the selection in each case, the company states, being the result of competitive tests:

Chicago Union Station, 493 units and the Fair Store, 150 units. J. L. Hudson Department Stores, Detroit, 215 units. Carrier Engineering Corporation, engineers. Ford Motor Company, Reed filter installation for the company's drying and finishing rooms. Bridges Art Museum, Los Angeles, Calif., installation of Reed filters in connection with ventilation system, Holmes & Sanborn, engineers.

New Incorporations

Terry Ventilating Heater Co., Los Angeles, Calif., capital $300,000. Directors: E. D. Lientz, Glendale; E. P. Eiden, C. M. Lundsey, R. R. Stockburger and C. D. Wells, all of Los Angeles.

Home Heating Service, Newark, N. J., capital $100,000, to manufacture burners. Incorporators: William Kirk, Madeline Kaitman, Orange, N. J.; and Herman Waitman, Newark, N. J.

Central Station Heating Notes

Hibbing, Minn.—An addition to the municipal central heating and power plant of Hibbing will be built at a cost of $176,467.

Portland, Ore.—An extension of the steam heating service of the Northwestern Electric Company to supply the west side business territory bounded by Main, Yamhill, West Park and 15th Street, will be completed, it is expected, during August. The extension will cover 13 additional city blocks and will comprise some 2500 ft. of piping. Among the buildings which will take central steam service from the extension are: the new Masonic Temple and the Medical Arts Building. The work will come to $50,000.

New Firms and Business Changes

B. F. Fink Plumbing and Heating Co., Topeka, Kans., is the new name under which the C. F. Gustafson Plumbing and Heating Company will be known. B. F. Fink, president of the new organization, was a partner in the Gustafson company for many years.

Chattanooga Heating and Plumbing Co., Chattanooga, Tenn., has developed from the Chattanooga Heating Co. The new department has secured a number of heating contracts for residences and commercial buildings.

Glen L. Conlee, for several years a member of the C. A. Dunham organization, has been appointed university mechanical engineer at the University of Illinois, where he will have charge of the designing of all heating, ventilating and elevator installations, as well as supervision of all existing mechanical and electrical equipment.

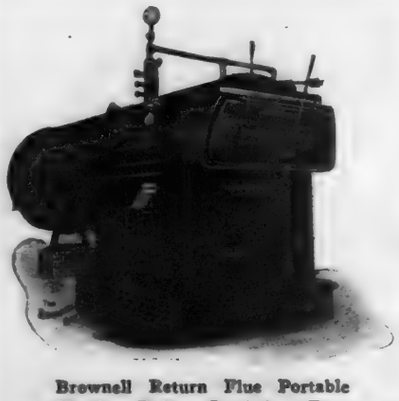
Kansas City Chapter

New officers of the Kansas City Chapter, elected at its closing meeting, May 12, are as follows: President, N. W. Downes; vice-president, B. F. Cook; secretary, R. B. Johnson; treasurer, Ben C. Taylor. Board of governors: W. N. McIntyre, C. H. Carr and David Caleb.

PATENT AND PROTECT
Your valuable inventions
and
Register your trade marks.
Prompt attention. Superior Service
Lester L. Sargent, Patent and Trade Mark Attorney.
524 10th Street, Washington, D. C.

SOLD BY SUPPLY HOUSES

STEAM TRAPS
AIR TRAPS
STEAM SEPARATORS
EXHAUST HEADS
OIL SEPARATORS
BOILER ALARM WATER COLUMNS
STRAINERS
WRIGHT AUSTIN
WRIGHT-AUSTIN CO.
DETROIT, MICHIGAN


Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL
Better Boilers for Heating and Power Purposes
70TH YEAR
of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.
BROWNELL Steel Heating Boilers are
LOW IN FIRST COST
HIGH IN EFFICIENCY
BUILT TO LAST A LIFETIME
Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.
THE BROWNELL CO.
DAYTON, OHIO
Established 1855
Send for Bulletins B6 B6A
BOILERS

1340 Years' Experience

GRINNELL Adjustable Pipe Hangers ought to be the last word in such a product. Into them is built all the experience of our 134 installation foremen. On the average their experience with us is 10 years each. That's 1340 years' piping experience. No wonder these hangers make installation work easier and the finished job better. We use them invariably. You will, too, if you try them once. Our 120-page catalog tells how to choose the right hanger for any job. Send for your copy today.

If your jobber doesn't stock Grinnell Hangers, write us for the name of the nearest distributor. Address Grinnell Company, Inc., 280 W. Exchange Street, Providence, R. I.

GRINNELL

Fittings, Hangers, Valves, Pipe Bending Welding, Piping Supplies, Etc.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

INVITATION FOR BIDS

Sealed bids will be received by the NEW YORK STATE BRIDGE AND TUNNEL COMMISSION and NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION at the office of the Commissions, Room 3004, Woolworth Building, New York City, until 1:30 o'clock, P.M. (Eastern Standard Time) Tuesday, September 8th, 1925.

FOR FURNISHING VENTILATING AND TRANSFORMER FANS WITH NECESSARY MOTOR, CONTROL AND TRANSMISSION FOR EACH AND INSTALLING THIS EQUIPMENT IN THE NEW YORK AND NEW JERSEY VENTILATION BUILDINGS, KNOWN AS CONTRACT NO. 12 OF THE HOLLAND TUNNEL.

The principal items of the contract are furnishing and installing 84 ventilating fans and 6 transformer blower fans and 90 motors. At the above place and time the bids will be publicly opened and read. The award of the contract, if awarded, will be made by the Commissions as soon thereafter as practicable. The Commissions reserve the right to reject any and all bids.

Bonds in the sum of One Hundred Thousand ($100,000) Dollars each to the State of New York and to the State of New Jersey will be required for the faithful performance of the contract.

No bids will be received or considered unless accompanied by two certified checks upon a National or State Bank or Trust Company, satisfactory to the Commissions and located in New York City or the cities of Newark or Jersey City in the sum of Twenty Thousand ($20,000) Dollars each, one payable to the order of the "Comptroller of the State of New York," and the other to the order of "The New Jersey Interstate Bridge and Tunnel Commission."

The time allowed for the completion of the work is 14 months 2 weeks after the date of the delivery of the contract.

Book containing forms of invitation to bid, proposals, contract, specifications and bond and contract drawings, etc., can be obtained at the office of the Commissions for the sum of $5.00.

New York State Bridge and Tunnel Commission,
GEORGE R. DYER,
Chairman.

New Jersey Interstate Bridge and Tunnel Commission,
THEODORE BOETTGER,
Chairman.

POSITIONS WANTED

YOUNG MAN, age 18, desires position with heating engineers. Has experience at pipefitting; also on the installation of domestic oil burners. Would like to have the opportunity to learn drafting or estimating. Address Box 83, care Heating and Ventilating Magazine.

ESTIMATING AND SALES HEATING ENGINEER—Responsible position desired by man thoroughly experienced in estimating heating and power-plan work, having also outside training as sales engineer, and a good general knowledge and ability in connection with plan work. Can efficiently take charge of sales or estimating department. Address Box 81, care Heating and Ventilating Magazine.

CAPABLE HEATING ENGINEER would like to secure a position as heating engineer, sales engineer or heating estimator with reliable concern. Is twenty-nine years old and has had nine years' experience in the heating trade. Can furnish excellent references. Address Box 82, care Heating and Ventilating Magazine.

POSITIONS OPEN

SALES ENGINEERS—We need several sales engineers, preferably with heating and ventilating experience, to handle our heating and ventilating units. Can place men immediately in Detroit, Chicago, Minneapolis, St. Louis and other large cities. Address Buckeye Blower Co., Columbus, O., stating experience.

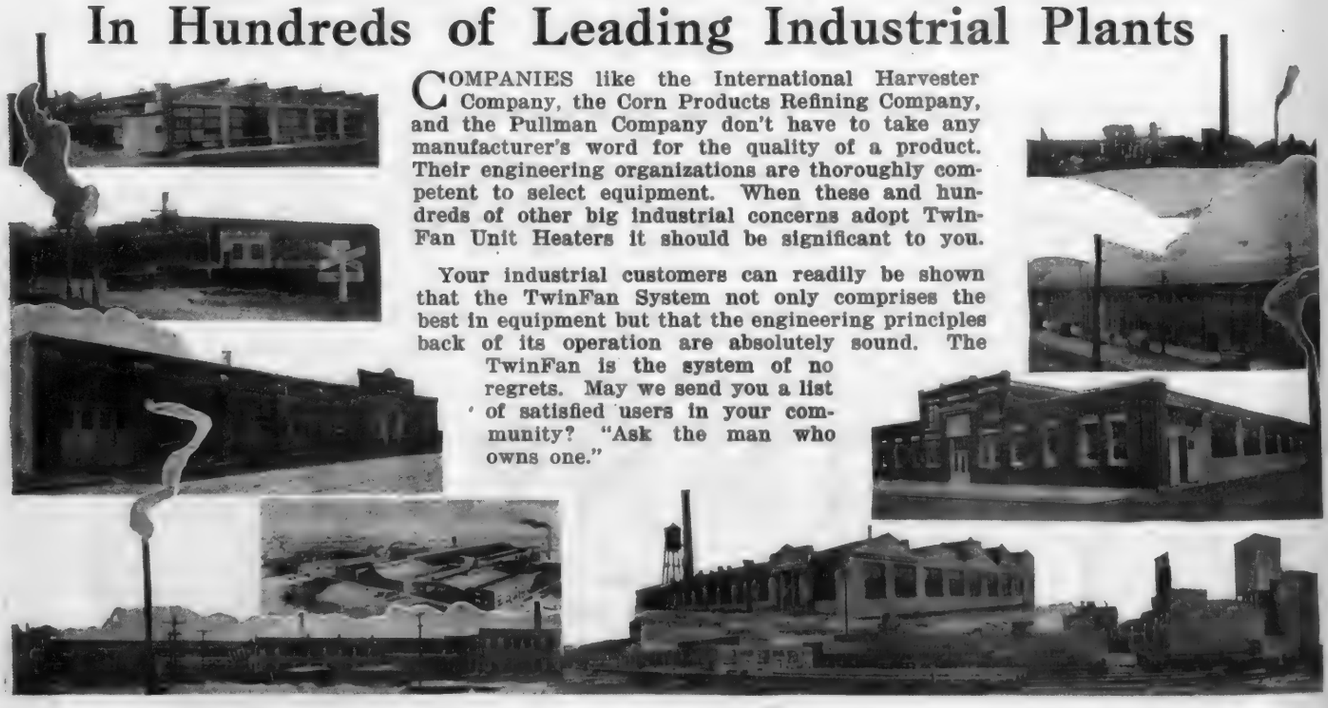
EXPERIENCED SALESMEN by a prominent manufacturer of cast-iron boilers and radiators. Liberal compensation and splendid opportunities for advancement. Openings in several sections of the country. In reply, state age, education, experience and present employer. Address Box 85, care Heating and Ventilating Magazine.

REPRESENTATIVE WANTED IN BALTIMORE

Manufacturer of nationally-known product, used in modern ventilation, is seeking a representative in the Baltimore territory. Prefer a man already established, handling kindred lines, who is familiar with ventilation work and known among architects and engineers. All correspondence will be treated with strict confidence. Give complete information in first letter. Address Box 84, care Heating and Ventilating Magazine.

TWINFAN Unit Heaters

In Hundreds of Leading Industrial Plants



COMPANIES like the International Harvester Company, the Corn Products Refining Company, and the Pullman Company don't have to take any manufacturer's word for the quality of a product. Their engineering organizations are thoroughly competent to select equipment. When these and hundreds of other big industrial concerns adopt TwinFan Unit Heaters it should be significant to you.

Your industrial customers can readily be shown that the TwinFan System not only comprises the best in equipment but that the engineering principles back of its operation are absolutely sound. The TwinFan is the system of no regrets. May we send you a list of satisfied users in your community? "Ask the man who owns one."

DWYER EQUIPMENT COMPANY

4534 W. NORTH AVE. CHICAGO, ILL.

Good-bye Expansion Tank

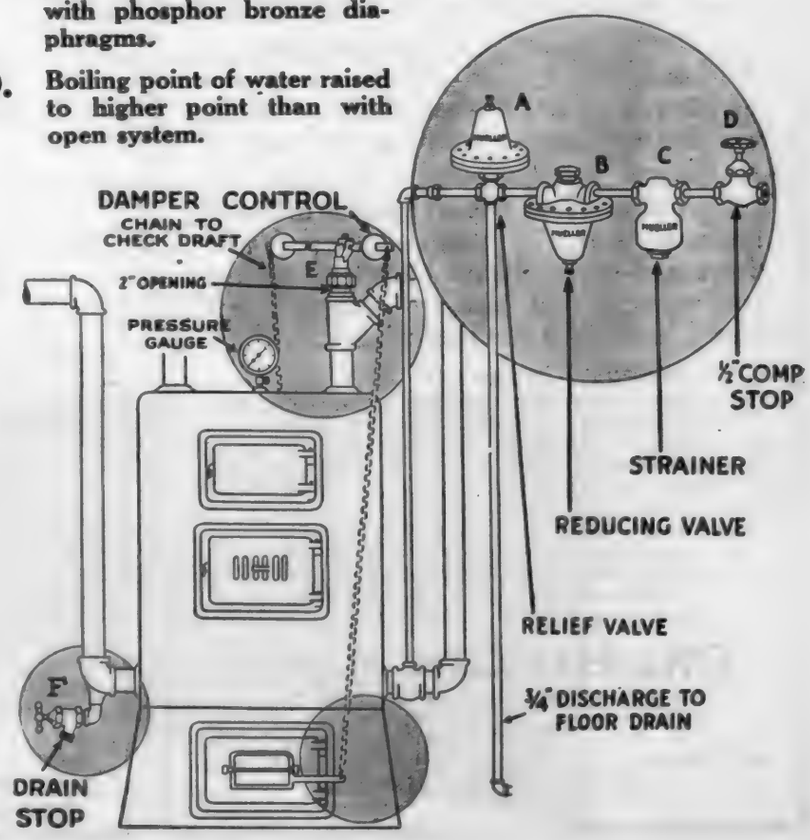
Mueller's System of Hot Water Heat Control has revolutionized hot water heating installations. It completely eliminates and supersedes both the overhead open tank and the closed basement tank. To accomplish this the Mueller Co. perfected special reducing and relief valves and combined them with a perfected damper regulator. So now —absolutely **without** any tank—the water supply is furnished automatically, relief is automatic and damper regulation is automatic.

Read the great advantages listed below. Write for further information and remember this—**the installation does not cost one penny more than the antiquated open or closed tank makeshift.** Every installation of a Mueller System **cuts your labor cost** and **increases your merchandise sales!**

MUELLER

Automatic Hot Water Heat Control

1. **No expansion tank, either open or closed.**
2. **Quickly installed on either new or old jobs.**
3. **Water in system always fresh.**
4. **Rapid circulation, due to pressure and fresh water.**
5. **Entirely automatic as to supply, relief and damper regulation.**
6. **A very considerable saving in fuel, due to automatic control of dampers and rapid circulation.**
7. **Perfectly safe, as both reducing valve and relief valve are operated by the pressure of the water in the system.**
8. **The reducing and relief valves are positive in action and durable, the working parts being made of bronze with phosphor bronze diaphragms.**
9. **Boiling point of water raised to higher point than with open system.**



Distributed by Leading Jobbers Everywhere

MUELLER CO.

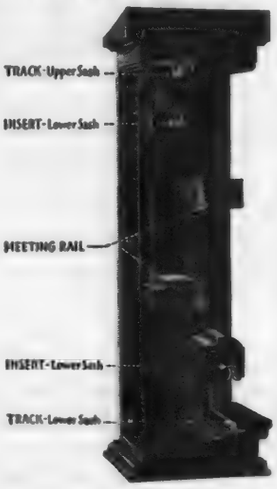
(Established 1857)

Factories: Decatur, Ill., Port Huron, Mich.

Branches: New York, San Francisco, Los Angeles

Canadian Factory: MUELLER, Ltd., Sarnia

HIGGIN
ALL METAL
WEATHER STRIPS



The patent *Insert* strip makes Higgin Weather-strips extra draft-tight

Higgin Weatherstrips are the only all-metal strips with the self-holding spring flange **Insert** in the sash. This **Insert** is important.

It makes a perfectly draft-tight contact at every point. Swelling or warping cannot prevent accurate fit and closure.

Without the Higgin Metal Insert the wooden groove will wear, swell or shrink, causing sticking or allowing seepage of air through the apertures.

Higgin Strips are "Metal against metal all the way round." Higgin-equipped windows and doors always keep cold air out and warm air in, operate smoothly and easily, and never need refitting.

HEATING ENGINEERS! You can safely guarantee a definite heating efficiency for your equipment when Higgin All-Metal Weatherstrips are installed. They keep all the cold air out and all the warm air in. They never loose their close fit by warping or shrinkage of frames. Every job is installed by trained Higgin men and guaranteed by the Higgin organization. Recommend Higgin All-Metal Weatherstrips to your customers.

The HIGGIN Mfg. Co.
Newport, Ky.
Toronto, Canada.

Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens

THE FACT
That After 15 Years the First
Knowles Mushrooms
Are still in Perfect Condition has something to do with their
Present Popularity

Patented
Knowles "Notch" Type Air Diffuser

They have always been castings of the best grey iron, and made to withstand all kinds of abuse incident to

Public Auditoriums

Knowles Mushroom Ventilator Co.
202 Franklin St., New York

AIR CONDITIONING TRADE MARK

APPARATUS for maintaining artificial atmospheric conditions in industrial plants.

ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BLDG.
PHILADELPHIA

JAMES M. SEYMOUR
Established 1888
Lawrence St., Mechanic St. and Kirk Place, NEWARK NEW JERSEY

AUDITORIUM FANS, 36" to 120" to fit any squarer opening. SEYMOUR FANS sold subject to substantial discount. Furnished with suitable pulley or coupling for direct connection. TWIN FANS include shafting and center bearing.

Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.

SEND for BULLETINS, PRICES, and DISCOUNTS

Our New Heatovent Catalog for Architects and Engineers is Now Ready for Distribution

Write for your copy

BUCKEYE BLOWER COMPANY

Columbus, Ohio

1400 Broadway, New York City
333 Jackson Bldg., Buffalo, New York
2126 Edmondson Ave., Baltimore, Md.
210 Dooly Building, Salt Lake City, Utah
709 Columbia Bank Bldg., Pittsburgh, Pa.
1011 Pioneer Trust Bldg., Kansas City, Mo.
Fales Building, Seattle, Washington
372 Whitehall Street, Atlanta, Georgia
1236 Calowhill Street, Philadelphia, Pa.
405 Sharon Building, San Francisco, Cal.
1227 California Street, Denver, Colorado
Builders Exchange Rose Bldg., Cleveland, Ohio
138 East Corning St., Syracuse, N. Y.

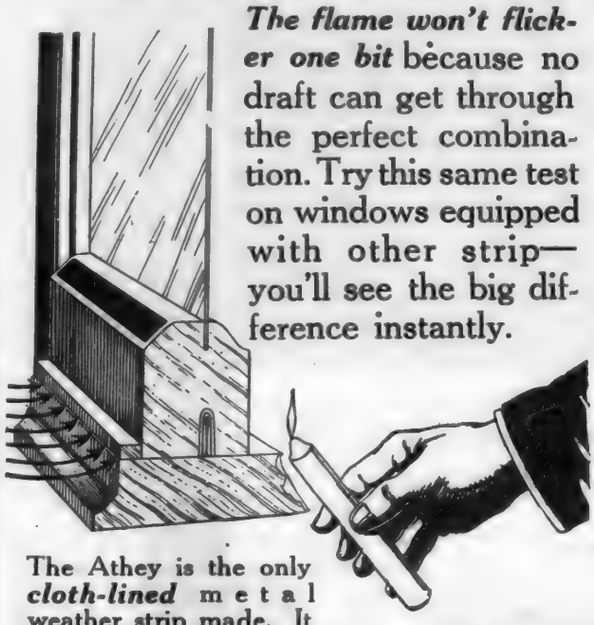
Athey

Cloth-Lined Metal Weatherstrip

(For Wood or Metal Windows)

Test it this way when the wind blows hard

Hold a flaming match to the joint of a window equipped with Athey Cloth-Lined Metal Weather Strip!



The flame won't flicker one bit because no draft can get through the perfect combination. Try this same test on windows equipped with other strip—you'll see the big difference instantly.

The Athey is the only ***cloth-lined*** metal weather strip made. It is impossible to fit two pieces of metal together tight enough to keep out dust and drafts without making the windows stick. In Athey strip the metal rail runs ***smoothly*** and ***easily*** in a metal channel lined with cloth. No draft or dust or noise can "sneak" through. You can't suck flour through the joint with a vacuum cleaner. ***Write for complete information and prices.***

Athey Products

SEE OUR CATALOGUE IN SWEETS

Perennial Window Shades Disappearing Partitions
Skylight Shades Cloth-Lined Metal Weatherstrips

Athey Company

6087 West 65th Street, Chicago, Illinois

In CANADA: Cresswell-McIntosh, Reg'd
270 Seigneurs St., Montreal, Que.

HEATS IN WINTER COOLS IN SUMMER

The heating system which remains idle during the summer months does not give your customer the full benefit of his investment.

Wing Featherweight Unit Heaters

present a most efficient means of heating industrial plants, mills, garages, factories, etc., during the winter time and in addition serve as a cooling medium in summer by circulating large volumes of air throughout the building. It is also possible to arrange each installation so as to introduce fresh air from outdoors with these units.

The saving effected by the dual operation of this equipment is sure to hold the interest of your customers. Let us further explain.

L. J. Wing Mfg. Co.

Fans and Blowers *Damper Regulators*
Unit Heaters *Small Turbines*
Hudson and 13th Sts. **NEW YORK**

High Grade Self-Improvement Home Study Course in

Gravity Steam and Water Heating

(by Mail)

Covering Fundamentals of Heating—Hot Water Heating Systems—Radiators and Radiation—Gravity Steam Heating Systems—Hot Water and Steam Boilers—Cost Estimates

Written, prepared and handled by

Ara Marcus Daniels, Consulting Engineer

Woodward Bldg. **Washington, D. C.**

ASK ABOUT COURSE HB **NOT A SCHOOL**

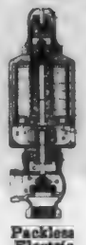
(Formerly A-EM-DEE Engineering Co.)

GOLD — HEATING & LIGHTING — NEW YORK

AUTOMATIC

HEAT REGULATION

ELECTRICALLY OPERATED



Packless Electric Valve

Whether it be for an isolated room or complete building, Gold's Control will give you that desired equable temperature. Energy derived from the 110 volt lighting current.

Thermostat

Write for General Catalog with Testimonials

GOLD CAR HEATING & LIGHTING CO.

BUSH TERMINAL

220 36th STREET **BROOKLYN, N. Y.**

Why Sturtevant Silentvanes

are universally accepted as the most efficient fans for ventilation

11 Silentvane Fans and 6 Sturtevant Air Washers are installed in the Hotel Olympic (pictured above), Seattle, Washington.
George B. Post & Sons, Arch.; Meyer, Strong & Jones, Eng.; Grant Smith & Company, Cont.

When Silentvanes were first put on the market, a little over three years ago, architects and engineers were quick to realize that these fans filled a great need in the ventilating field. The five prominent features found in Silentvanes are the reasons why so many architects and engineers have selected these fans in preference to all others.

Silentvanes run more quietly at higher speeds, develop a maximum efficiency of 83%, and save on power and motor costs. The self-limiting horse power characteristic prevents motor overload and eliminates the necessity of providing a motor rating excessively greater than the fan load requires in operation.

Are Sturtevant Silentvanes meeting all ventilating requirements successfully?

Today, over a thousand are in operation. The splendid performance of these fans in many of the most prominent buildings throughout the country is ample proof of their efficiency.

Upon request we will gladly give you the location of the nearest Silentvane installation in your territory so that you may see these fans in practical operation.

Let us send you our Silentvane Bulletin No. 290. It is just the right size for your files.

B. F. STURTEVANT COMPANY

Sales Engineering Offices

Atlanta, Ga. — Los Angeles, Cal.
Boston, Mass. — Minneapolis, Minn.
Buffalo, N. Y. — Montreal, P. Q.
Camden, N. J. — New York City
Chicago, Ill. — Pittsburgh, Pa.
Cincinnati, Ohio — Portland, Ore.
Cleveland, Ohio — Rochester, N. Y.
Dallas, Tex. — St. Louis, Mo.
Detroit, Mich. — Salt Lake City, Utah
Denver, Colo. — San Francisco, Cal.
Hartford, Conn. — Seattle, Wash.
Indianapolis, Ind. — Toronto, Ont.
Kansas City, Mo. — Washington, D. C.

Plants located at

Hyde Park, Mass. — Berkley, Cal. — Camden, N. J.
Sturtevant, Wis. — Framingham, Mass. — Galt, Ontario

Foreign Representatives

American Trading Co. — Tokio
American Trading Co. — Shanghai
Catton Neill Eng. & Mach. Co., — Manila
H. P. Gregory Co., Ltd. — Sydney
Honolulu Iron Works Co., — Honolulu, T. H.
Blair, Reed & Co., Ltd. — Wellington
Wesselhoeft & Poor — Caracas
Wesselhoeft & Poor — Bogota
General Machinery Co. — Tampico
Pedro Maritino, Inc. — Lima
Compania Italio-Americana de Importacion — Buenos Aires
A. E. Barker — Johannesburg

1356

NOW! you can increase efficiency

And make your business show added profits

The loss of time, the uncomfortable, displeased working force, which is the result of a poorly equipped heating system is the prime reason for many a man's balance sheet showing loss instead of gain.

"PECCO" Heating Systems have solved these problems for Factories, Garages, Halls, etc., where spaces of large cubic contents require extraordinary heating equipment. The solution of your heating problems is a specialty of our engineers whose years of study and practical experience have made them 100% proficient. All of these "PECCO" extends to you as a part of its most excellent service.

We also manufacture Direct Fired Heating Systems.

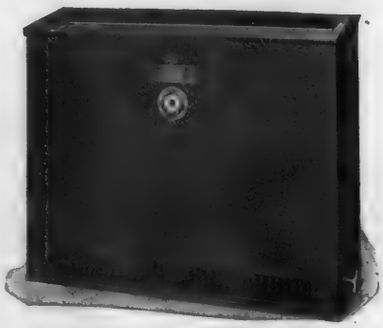
PECCO INCORPORATED

2937 North Market Street ST. LOUIS, MO.

PECCO INC. ST. LOUIS

Write today for Catalog showing some representative "PECCO" installations.

PEERVENT

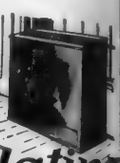


The latest improvement in Heating and Ventilating Units. Equipped with our new Peerfin Radiator. Write for information

PEERLESS UNIT VENTILATION CO., INC.

SKILLMAN AVENUE AND HULST STREET
LONG ISLAND CITY, NEW YORK

PEERLESS



UNIT SYSTEM

Heating and Ventilating

SELF OILING BEARINGS

AN EXCLUSIVE AND PATENTED FEATURE OF

Supreme Multiblade Disc Fans

Successfully Applied to Mechanical Furnace Systems.

Drying, Cooling, Ventilation and General Factory Service.

PRICES SHOW SAVINGS OF 20 to 30%

Noted for accessibility of bearings — Located outside of fan — Positively dust-proof.

The blade design is rendering efficient and economical operation under all conditions of service.

Write for Catalog today

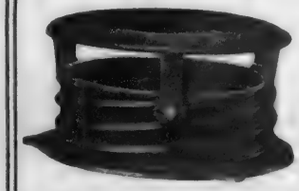
Supreme Heater & Ventilating Corp.

Engineers and Manufacturers, ST. LOUIS, MO.

SALES ENGINEERS—Some desirable territory is open on this line

For VENTILATION use LYON Toad Stools

They are Vent Caps of great strength, unobstructed throat, rigid non-rattling construction. The adjustment is from full open to full closed. The height of the floor member prevents sweeping dust and refuse into them. Their efficiency and economy make them particularly adaptable for theatres, auditoriums, etc.



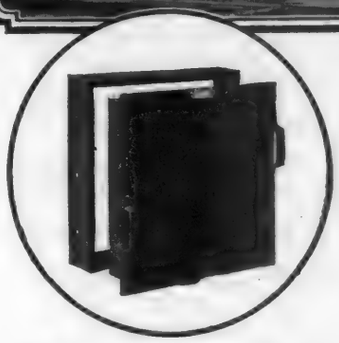
Send for table of capacities and velocities. Prices etc

LYON PRODUCTS CO., Inc.

7 So. Dearborn St.
CHICAGO ILLINOIS

REED AIR IS CLEAN AIR

Above: The Frank Douglas High School, Baltimore, Md. Left: Clifton Park High School, Baltimore, Md. Both schools equipped with Reed Air Filters.



The lower illustration shows a single Reed Air Filter unit. Because of this unit principle, Reed Air Filters are easily adapted to any ventilation requirements at relatively little cost.

Baltimore Schools Reorder REED AIR FILTERS *after six-months test*

Six months after Reed Air Filters were installed in the Clifton Park High School, Baltimore, an installation was ordered for the Frank Douglas High School of that city.

In whatever way Reed Air Filters are tested, whether by practical use or by scientifically conducted tests, they prove their ability to clean a maximum amount of air, most efficiently, with least resistance to air flow and at lowest cost.

Reed Air Filters may be installed in any ventilating system, old or new. Require little space. Send today for any of the bulletins listed on the coupon.

REED AIR FILTER COMPANY, *Incorporated*
215 Central Avenue, Louisville, Kentucky
Offices in Principal Cities

REED AIR FILTER COMPANY, Inc.
215 Central Avenue, Louisville, Ky.

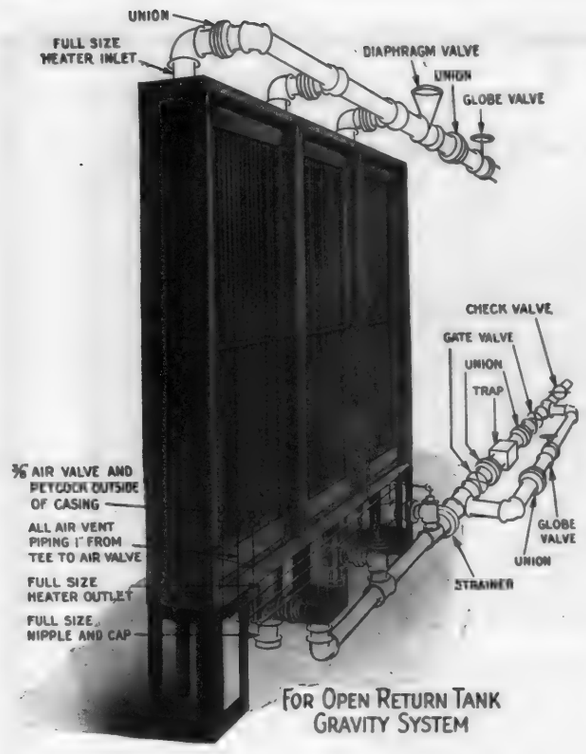
Gentlemen: Please send me without obligation the following bulletins:

No. 105—The Reed System of Air Filtration
No. 107—Data, Tests and Specifications
No. 108—Reed Air Filters for General Ventilation.

Application ..... C. F. M. Required
.....
Name .....
Address .....

Reed Air
TRADE MARK
filters ALL METAL

(*REED AIR FILTERS are manufactured under patents of May 16, 1922, Feb. 12, 1924, Nov. 18, 1924. Other patents pending.*)



FOR OPEN RETURN TANK GRAVITY SYSTEM

AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, *Sec'y and Chief Engineer*

AEROFIN

Fan-System Heating Surface

To Engineers, Architects and Contractors

THREE YEARS OF SUCCESSFUL SERVICE demonstrates that AEROFIN has established itself as a dependable product.

ENGINEERS OF NATIONAL REPUTATION AND TWENTY YEARS' EXPERIENCE WITH FAN SYSTEM HEATERS, are responsible for the design, development, manufacture and marketing of AEROFIN, and their services are at your command to assist you in working out your heating, ventilating, cooling and drying problems.

SINCE THERE IS NO EQUAL TO AEROFIN, WHY NOT SPECIFY IT OUTRIGHT? Plans and specifications should show sizes and number of units, with piping details.

AEROFIN HAS A TREMENDOUS ADVANTAGE in its LIGHTWEIGHT. AEROFIN weighs only 9% to 25% as much as the old-fashioned heavy heaters. AEROFIN SAVES A GREAT DEAL OF SPACE.

AEROFIN IS MADE OF NON-CORROSIVE METALS. This feature meets with universal approval.

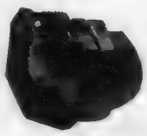
THE INSTALLED COST OF AEROFIN IS GENERALLY LESS than that of cast-iron heaters and pipe coils. AEROFIN (completely encased) can be erected in the same number of HOURS as is required in DAYS to erect the heavy heaters. This means a great saving in erecting cost.

THE INSTALLATION OF AEROFIN WITH VERTICAL TUBES IS RECOMMENDED as this arrangement is less subject to errors of installation and operation. THE HORIZONTAL TUBE ARRANGEMENT is satisfactory when installed in accordance with our instructions and diagrams.

Write for catalog, instruction leaflet and service details.

Aerofin is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus.

Wonderful Savings in the Cost of Heating are made with Metering Radiator Bushings



Patent Allowed

Let us tell you about the savings the users of this simple device are obtaining.

Used to decided advantage on any return line or vacuum installation. Equally good for correcting installed plants as for plants being installed. A wonderful device for reconstructing extravagant plants at a price that will get the job.

Write for circulars

They are placed in supply end and proportion the steam to each radiator as required.

THE HOLLEY MANUFACTURING COMPANY
529 Seventh St. South, Minneapolis, Minn.

CENTRAL STATION STEAM CO.

2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF
Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

SEE OUR DETAILED DATA IN A.S.H.&V.E. GUIDE

MANUFACTURED WEATHER makes "Every day a *good* day"

Humidification · Dehumidification
Heating · Ventilation · Purification
Drying

Carrier
Engineering Corporation
750 Frelinghuysen Ave. Newark, N. J.
Boston Buffalo Chicago New York Philadelphia Los Angeles

SEE OUR DETAILED DATA IN A.S.H.&V.E. GUIDE

An Announcement By

"Buffalo"

It is our privilege to announce a complete revision of the only hand book on the various applications of fans and kindred apparatus. Published originally in 1914, it was reprinted in 1920. The present edition has been brought up to date, new sections added, and others re-written, making

A new, very complete edition of "Fan Engineering"

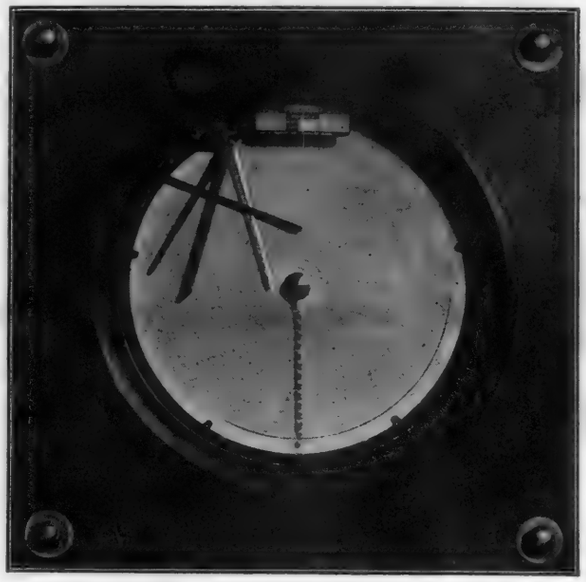
Packed with practical information about all types of fans, their characteristics, properties, and applications, the new book is divided into three parts. Part I deals with the physical properties of air, heat and humidity, the flow of air in general, and systems of air distribution in particular. Part II relates to the application of air and air movement to the various classes of work for which fans are used. Part III contains examples of proper arrangement of fans and heating and ventilating apparatus, also much information about equipment, and rating of various sizes and types of fans.

The book is 4½ x 7", and less than ¾ of an inch thick, despite its 612 pages. Beautifully printed on Warren's "Thintext", bound in flexible black "Fabricoid" with gold edges and rounded corners, this book will stand the constant use to which many owners will subject it. Orders sent to us will be promptly filled.

Price $4.00 per copy.

Buffalo Forge Company

480 BROADWAY, BUFFALO, N. Y.



For Accurate Measurement of Liquids

What liquids do you want to measure—water, oil, syrup, chemicals?

If you require continuous and accurate inventories of liquids in storage or in motion regardless of their specific gravity or the height of the instrument to the liquid level, you need

FOXBORO LIQUID LEVEL GAUGES

the modern and most accurate measuring sticks for liquids.

The photograph above shows a Foxboro Liquid Level Gauge equipped with high and low electric alarm attachments, recording water levels in twin 10,000 gallon tanks on the roof of the Biltmore Hotel, Los Angeles. The instrument is located in the engine room 350 feet beneath the bottom of the tanks. It could just as well have been 1200 feet distant. Foxboro instruments are guaranteed to be accurate under all conditions. Write for Bulletin 82-2.

THE FOXBORO CO., Inc.

Neponset Avenue, FOXBORO, MASS., U. S. A.

New York Chicago Philadelphia Boston Pittsburgh
Cleveland Tulsa Rochester Birmingham
San Francisco Los Angeles Portland, Ore.

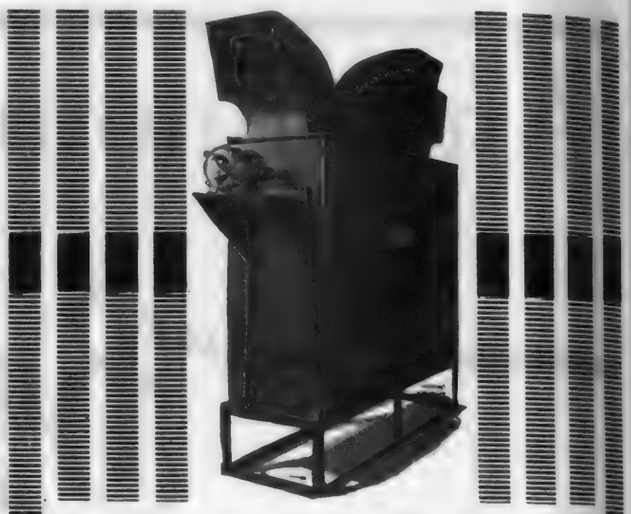
Peacock Brothers, Limited, 179 Delorimier Ave., Montreal, Canada.

Sole British Representatives: Walker, Crosweller & Co., 66 Dane's Inn House, Strand, London, W. C. 2.

FOXBORO

REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY



YORK UNIT HEATERS

Power Reduced

The power required to operate York Welded Coal Unit Heaters has been reduced 1/2 to 2/3, as a result of a year's research by our engineers. The York Heater, directly coupled at standard motor speeds, costs no more than a belted unit.

York Units have Welded Pipe Coils (no leaks) and a centrifugal type housed fan (better heat distribution) operating on dustproof ball bearings, (no bearing trouble). They operate on vacuum, low or high pressure steam, up to 150 lbs.

Catalog on Request.

York Heating & Ventilating Corp.

1506 Locust Street, PHILADELPHIA

A New and Profitable Field Now Available

C. S. B. Approved Sprinkler Heads may now be bought from us direct, either separately or with all other necessary sprinkler equipment. This opens a new and profitable field for you that has not been available heretofore. There are many prospects for sprinkler systems in your vicinity. Get in on this business at a good profit.

Also, after a fire, sprinkler heads have to be replaced. A stock should be kept on hand for demands of this nature.

Write us for prices and details. We cooperate with you in every way.

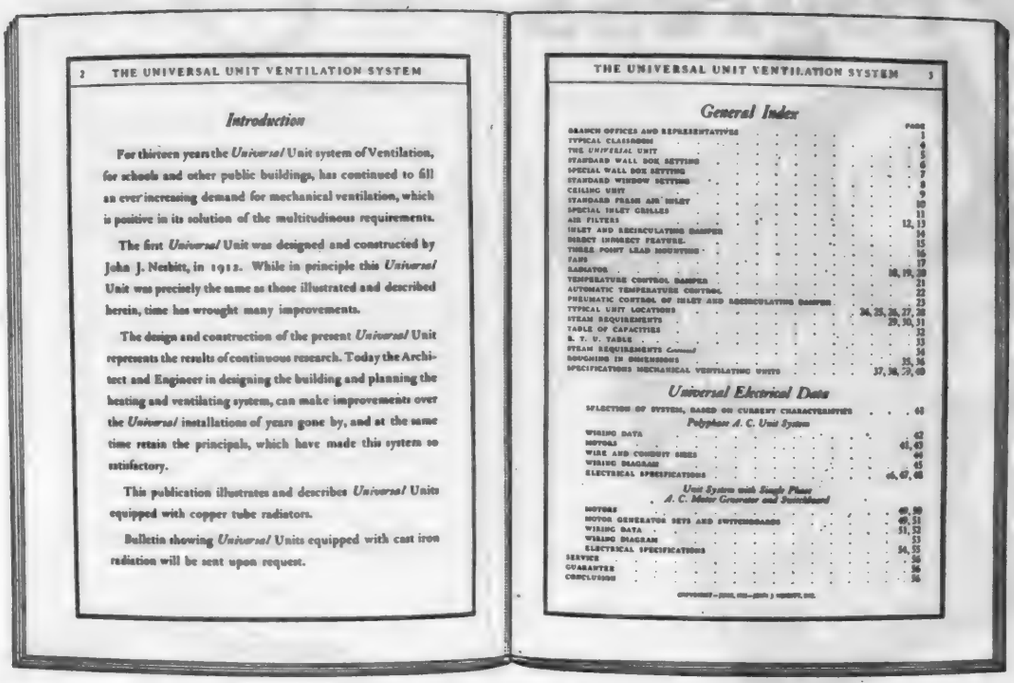
C. S. B. SPRINKLER CO.

54 Batterymarch St., Boston, Mass.

Factory: Laconia, New Hampshire

Canadian Representatives: L. E. Moulin Co., Inc., 142 Inspector St., Montreal, Canada.

The Universal Unit Ventilation System



2 THE UNIVERSAL UNIT VENTILATION SYSTEM

Introduction

For thirteen years the *Universal* Unit system of Ventilation, for schools and other public buildings, has continued to fill an ever increasing demand for mechanical ventilation, which is positive in its solution of the multitudinous requirements.

The first *Universal* Unit was designed and constructed by John J. Nesbitt, in 1912. While in principle this *Universal* Unit was precisely the same as those illustrated and described herein, time has wrought many improvements.

The design and construction of the present *Universal* Unit represents the results of continuous research. Today the Architect and Engineer in designing the building and planning the heating and ventilating system, can make improvements over the *Universal* installations of years gone by, and at the same time retain the principals, which have made this system so satisfactory.

This publication illustrates and describes *Universal* Units equipped with copper tube radiators.

Bulletin showing *Universal* Units equipped with cast iron radiation will be sent upon request.

THE UNIVERSAL UNIT VENTILATION SYSTEM 3

General Index

	PAGE
BRANCH OFFICES AND REPRESENTATIVES	1
TYPICAL CLASSROOM	4
THE *UNIVERSAL* UNIT	5
STANDARD WALL BOX SETTING	6
SPECIAL WALL BOX SETTING	7
STANDARD WINDOW SETTING	8
CEILING UNIT	9
STANDARD FRESH AIR INLET	10
SPECIAL INLET GRILLES	11
AIR FILTERS	12, 13
INLET AND RECIRCULATING DAMPER	14
DIRECT INDIRECT FEATURE	15
THREE POINT LEAD MOUNTING	16
FANS	17
RADIATOR	18, 19, 20
TEMPERATURE CONTROL DAMPER	21
AUTOMATIC TEMPERATURE CONTROL	22
PNEUMATIC CONTROL OF INLET AND RECIRCULATING DAMPER	23
TYPICAL UNIT LOCATIONS	24, 25, 26, 27, 28
STEAM REQUIREMENTS	29, 30, 31
TABLE OF CAPACITIES	32
A. T. U. TABLE	33
STEAM REQUIREMENTS *Continued*	34
DOUGHING IN DIMENSIONS	35, 36
SPECIFICATIONS MECHANICAL VENTILATING UNITS	37, 38, 39, 40

Universal Electrical Data

SELECTION OF SYSTEM, BASED ON CURRENT CHARACTERISTICS	41
Polyphase A. C. Unit System	
WIRING DATA	42
MOTORS	42, 43
WIRE AND CONDUIT SIZES	44
WIRING DIAGRAM	45
ELECTRICAL SPECIFICATIONS	46, 47, 48
Unit System with Single Phase A. C. Motor Generator and Switchboard	
MOTORS	49, 50
MOTOR GENERATOR SETS AND SWITCHBOARDS	49, 51
WIRING DATA	51, 52
WIRING DIAGRAM	53
ELECTRICAL SPECIFICATIONS	54, 55
SERVICE	56
GUARANTEE	56
CONCLUSIONS	56

THIS miniature reproduction of the introductory page and index gives an idea of the importance of the contents of the new Universal Unit Catalog and Engineers Data Book. Replete with data, tables, section drawings and photographs reproduced in black and colors, the catalog is unique as a reference book on Unit Ventilation. It is completely indexed, printed on heavy stock, bound to stand the wear of frequent use, and sized to fit your file.

Where Shall We Send Your Copy?

JOHN J. NESBITT, Inc.

Executive Office & Factory

213 NORTH VERMONT AVENUE

ATLANTIC CITY, N. J.

Branch Offices & Representatives

NEW YORK CITY

MINNEAPOLIS, MINN. ST. PAUL, MINN. PORTLAND, ORE.

DULUTH, MINN. DENVER, COLO. SEATTLE, WASH.

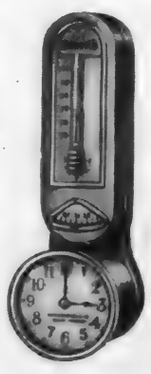
Consistent Progress

Minneapolis Heat Regulator sales showed a gain exceeding 54% for the first six months of 1925.

This is on top of a 49% gain in 1924 for the same period—and a gain of 74% for the first half of 1923.

Constantly increasing sales because the public insists on the Minneapolis Heat Regulator, the standard of the world for 40 years. The Minneapolis is used and enjoyed by nearly two million people. The new model 77 clock-thermostat is the most popular model we have ever built.

Write today for catalog.



MINNEAPOLIS HEAT REGULATOR CO.
Established 1885
2804 Fourth Ave., So.
MINNEAPOLIS, MINN.

The "MINNEAPOLIS" HEAT REGULATOR

FOR COAL—GAS—OIL

TRADE MARK
BRISTOL'S
REG. U. S. PAT. OFFICE

Accurate Record Means Close Control

The closeness with which temperature may be controlled depends first upon the accuracy of the method employed for measuring and recording the temperature.

Write for Catalog N-1303

Bristol Records make possible the closest kind of control for they are accurate.

The Bristol Company *Waterbury, Connecticut*

FOR 36 YEARS — MAKERS OF — BRISTOL'S — RECORDING INSTRUMENTS

The STICKLE Thermostatic Radiator Valve

The Expansion principle in return line Radiator Traps is not novel or new. Consequently the difference in this class of Traps is in the construction.

The expansive movement of this diaphragm is fully one-quarter inch, which is much more than is necessary for opening and closing the valve. This gives a factor of safety which is greater than any valve made, consequently it requires no adjustment. May we send you our bulletin?

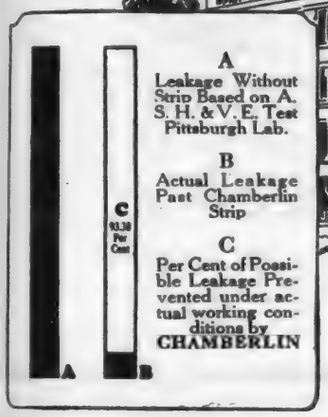
STICKLE STEAM SPECIALTIES CO.
INDIANAPOLIS, IND.

New York Office
46 E. 41st St.

Boston Office
52 Sudbury St.

Higher Efficiency from Heating Plants in Chamberlin-Equipped Buildings

Horace Mann School
New York City
Equipped in 1903 with Chamberlin Metal Weather Strips.


A
Leakage Without Strip Based on A. S. H. & V. E. Test Pittsburgh Lab.
B
Actual Leakage Past Chamberlin Strip
C
Per Cent of Possible Leakage Prevented under actual working conditions by CHAMBERLIN
C
A
B

How Chamberlin Tests are Made

Chamberlin installation tests are made by placing an air collection chamber over the entire inside of a window. Opposite doors and windows are opened to aggravate circulation. The inleakage past the strip is measured with an anemometer. Windows are not specially prepared for test and are always on the windward side of a building. Inleakage always includes leakages through the frame and pulley holes.

The Horace Mann School installation was tested on April 11, 1925. Actual leakage through windows with 20.67 lineal feet of crack was only 1.87 cubic feet. The wind velocity prevailing directly against the tested sash at the time was 7.5 M.P.H.

Even the best designed heating and ventilating system will not function efficiently when the inleakage of air through and around windows and doors is not controlled.

A series of tests made at Pittsburgh by the A. S. H. & V. E. and A. I. A. have determined as known quantities, air-leakages through unstripped double-hung windows at varied wind velocities.

By similar laboratory tests and by field tests, the percentage of air that can be kept out by a Chamberlin installation is also a known factor.

Actual results as secured in tests similar to that of the Horace Mann School, prove that Chamberlin Metal Weather Strips are correct in design and retain their high efficiency over a long term of years.

Because only Chamberlin mechanics trained to their work, are allowed to fit and install Chamberlin Weather Strips, the manufacturer stands back of every installation with a life-time guarantee.

Heating and ventilating engineers will find that a Chamberlin installation greatly simplifies their own problems, by contributing to more efficient heating of building interiors.

CHAMBERLIN METAL WEATHER STRIPS
SINCE 1893-THE STANDARD

New Catalog Just Out—Send For It

This book of details and specifications has been pronounced the most complete of its kind ever issued. Mail coupon for copy.

CHAMBERLIN
METAL WEATHER STRIP CO., INC.
Detroit, Michigan

80 Sales and Service Branches Throughout the United States

Chamberlin Metal Weather Strip Co.
Detroit, Michigan

Please send free copy of your new Detail Book. Also copy of illustrated booklet to show my clients.

Name _____

Address _____

City _____ *State* _____ V-8

OZONE FOR COMFORT

OZONE is the MOST ACTIVE oxidizing agent known to science.

It IMMEDIATELY oxidizes odoriferous gases, vitalizes and freshens the air in precisely the same way as is accomplished in Nature.

FRESH AIR FREE FROM ODORS, is essential to true COMFORT.

OZONIZED AIR IS FREE FROM ALL ODORS, IT IS FRESH, PURE AND VITALIZED.

We maintain our own Research Laboratories and Engineering Staff. Technical publications on OZONE sent on request.

MONTGOMERY BROTHERS

Chicago 1020 So. Wabash Avenue
San Francisco 61 Fremont Street
New York 50 Church Street

General Sales Agents for

THE UNITED STATES OZONE COMPANY
SCOTTDALE, PENNA.

You want a Swing Check that will work under all conditions—

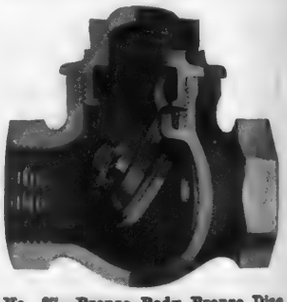
That is to say you need a ROUSE Swing Check Valve. Especially when you want positive action under all changes in pressure, install Rouse Swing Checks with vapor and low pressure heating service, and forget them.

The disc is made to open and close with hair trigger precision, opening instantly and closing with the slightest reversal of pressure.

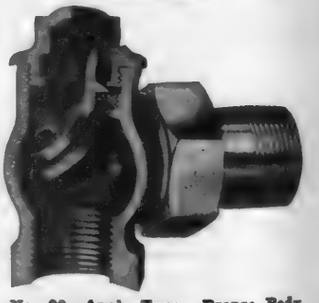
You can use the No. 87 Rouse Swing Check Valve in either horizontal or vertical position.

It is made from the finest bronze, and extra heavy construction assures the maximum strength.

ROUSE CHECKS also made in Iron Body, Bronze mounted, as follows—
No. 88—Screwed Ends—Sizes 2½" to 6"
No. 89—Flanged Ends—Sizes 2½" to 6"



No. 87—Bronze Body Bronze Disc Screwed Ends—Sizes ¼" to 3"
No. 87-A—Same as No. 87 but with leather disc



No. 90—Angle Type. Bronze Body with Union-Metal Disc—Sizes ⅛" to 1¼"

Scott Valve Manufacturing Company
3962 McKinley Avenue Detroit, Michigan

SCOTT SINCE 1886 VALVES
SIGN OF VALUE
"MAXIMUM SERVICE PER DOLLAR"

AMERICAN BLOWER VENTILATING EQUIPMENT

THE STANDARD OF THE WORLD

A Partial List of American Blower Equipped Public Buildings and Their Heating Contractors.

Auditorium
Colorado Springs, Colo.
A. E. Olson

Art Institute—Goodman Hall & Terrace Addition
Chicago, Ill.
L. H. Prentice Co.

Abou Ben Adhem Shrine Mosque
Springfield, Mo.
Wells Htg. Co.

Akdar Temple
Tulsa, Okla.
Miner D. Woodling Htg. & Vtg. Co.

Ancient Scottish Rite Bldg.
New Castle, Pa.
R. T. Withers Sons Co.

Auditorium & Market House
Memphis, Tenn.
Fischer Heating Co.

Biltmore Hotel
Los Angeles, Calif.
Thos. Haverty Co.

Book-Cadillac Hotel
Detroit, Mich.
Baker, Smith & Co., Inc.

Blumstein's Dept. Store
New York City, N. Y.
A. B. Barr & Co.

Bismarck Memorial Bldg.
Bismarck, N. Dak.
Frank Grambs

Business Men's Club
Cincinnati, Ohio
The Williamson Heater Co.

Baker Hotel
Dallas, Texas
Dixie Htg. & Vtg. Co., Inc.

Colorado State Hospital
Denver, Colo.
Alex Simpson Jr. Co.

Colorado Consistory No. 1
Denver, Colo.
John F. Pfeiffer

Cohen Bros. Store
Jacksonville, Fla.
Chattanooga Blow Pipe & Roofing Company

City Auditorium
Birmingham, Ala.
Alabama Supply Co.

Calif. Palace Legion of Honor
San Francisco, Calif.
The Scott Co.

Chase Hotel
St. Louis, Mo.
O'Mara Heating Co.

Continental Nat'l Bank
Indianapolis, Ind.
W. H. Johnson & Son Co.

Cottages—Letchworth Village Sanitarium
Thiels, N. Y.
E. W. Tompkins & Co.

Dives, Pomeroy & Stewart
Reading, Pa.
W. H. Taylor & Co.

Detroit Free Press Bldg.
Detroit, Mich.
H. Kelly Co.

Elks Temple
Omaha, Neb.
J. J. Hanighen Co.

Exchange National Bank
Tulsa, Okla.
J. L. Heath Co.

Elverson Bldg.
Philadelphia
Robt. J. Hoben

First Baptist Church
Minneapolis, Minn.
Chas. Wilkins & Co.

First National Bank
Birmingham, Ala.
Tully Heating Co.

Friday Morning Club
Los Angeles, Calif.
F. J. Donnelly

Federal Reserve Bank
Chicago, Ill.
Hanley & Co.

The Fair
Chicago, Ill.
The Haines Co.

Fifth Ave. Hospital
New York City, N. Y.
Baker, Smith & Co., Inc.

Free Library of Philadelphia
Philadelphia, Pa.
J. H. Cooney

Benj. Franklin Hotel
Philadelphia, Pa.
Baker, Smith & Co., Inc.

Institution for Feeble Minded
Orient, Ohio
W. H. Spohn Plg. Co.

Indianapolis Athletic Club
Indianapolis, Ind.
Freyn Bros.

Ithaca Savings Bank Bldg.
Ithaca, N. Y.
Jamieson & McKinney Co.

Hamilton Hotel
Washington, D. C.
G. & H. Heating Co.

McCrory Stores
Cleveland, Ohio
W. G. Cornell Co. and John C. Boehm

Masonic Temple
Madison, Wis.
Paul E. Mueller Co.

Masonic Temple
Topeka, Kans.
Geo. W. Sutherin

Miller Theatre
Wichita, Kans.
Simmons Plg. & Heating Co.

Memorial Auditorium
Chattanooga, Tenn.
Fred Cantrell Co.

Masonic Temple
Canton, Ohio
A. C. Eynon Plg. Co.

Masonic Temple
Birmingham, Ala.
Williams Plg. & Htg. Co.

Masonic Temple
Sioux City, Ia.
LeVelle & Hogan

Masonic Temple
Lansing, Mich.
F. C. Strudley & Son

Plaza Hotel Annex
New York City, N. Y.
Baker, Smith & Co., Inc.

Pizitz Store
Birmingham, Ala.
Wm. Gordon Corp. and The Pate Co.

Paramount Theatre
Sacramento, Calif.
Latourrette-Fical Co.

Pacific Tel. & Tel. Bldg.
San Francisco, Calif.
Scott Co.

Piedmont Theatre
Greenville, S. Car.
Poe Piping & Htg. Co.

Palace Theatre
San Antonio, Texas
A. H. Shafer

Palace Orpheum Theatre
Milwaukee, Wis.
Downey Htg. & Supply Co.

Packard Bldg.
Philadelphia, Pa.
Muench-Welamb Co.

Roosevelt Hotel
New Orleans, La.
Wm. Gordon Corp.

Rich Bros. Dept. Store
Atlanta, Ga.
Farrell Heating & Plg. Co.

Reynolds Memorial Auditorium
Winston-Salem, N. Car.
Grinnell Co., Inc.

Security Nat'l Bank Bldg.
Sheboygan, Wis.
Chas. A. Honold Co.

Standard Oil Bldg.
New York City, N. Y.
Child & Scott Co.

Strauss Bldg.
Chicago, Ill.
Thompson-Starrett Co.

St. Lukes Hospital
Chicago, Ill.
Narowetz Htg. & Vent. Co.

Sawyer Theatre
Chicago, Ill.
Bloomer Htg. & Vent. Co.

Scottish Rite Cathedral
St. Louis, Mo.
D. F. Edwards Htg. Co.

State Administration Bldg.
Lansing, Mich.
Wheeler-Blaney Co.

Starling-Loving Hospital
Columbus, Ohio
S. A. Esswein Htg. & Plg. Co

State Street Trust Co. Bldg.
Boston, Mass.
The McMurrer Co.

Temple Tifereth
Cleveland, Ohio
A. R. Brueggeman Co.

Temple Beth-el
Detroit, Mich.
Royal Heating Co.

Tivoli Theatre
Michigan City, Ind.
Simpson & Adamson

Travelers Insurance Co. Bldg.
Hartford, Conn.
Baker, Smith & Co., Inc.

Tiffin Theatre
Chicago, Ill.
Mehring & Hanson Co.

U. S. National Bank
Portland, Oregon.
Kendall Heating Co.

Vermillion Auditorium
Vermillion, S. Dak.
Thomas Htg. & Vtg. Co.

Western State Penitentiary
Rockview, Pa.
Steel City Heating Co.

All over the country today from the tallest skyscraper to the depths of mines, from the small office to the largest manufacturing plants American Blower Ventilating Fans are adequately and economically solving every type of ventilating problem. The ever increasing list of buyers who are expressing their faith in American Blower products is but a just tribute to their true value. This page contains a partial list of Public Buildings recently completed and under construction using American Blower apparatus.

Write for a bound set of our technical publications.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO CO., LIMITED, WINDSOR, ONTARIO

Hanford Hotel
Mason City, Iowa
W. J. Daly Co., Inc.

Jefferson Hospital, Samuel Gustine Thompson Annex
Philadelphia, Pa.
Lynch & Woodward, Inc.

Kosair Temple
Louisville, Ky.
A. J. Anderson

Lafayette Theatre
Lexington, Ky.
J. J. Fitzgerald Co.

Lowenstein Stores
Memphis, Tenn.
Hughes Heating Co.

Lyric Theatre
Logan, Utah
Haydn Long

McCrory Stores
Dayton, Ohio
John A. Grant

McCrory Stores
Savannah, Ga.
Austin Eng. Co.

Masonic Temple
Detroit, Mich.
Pittelkow Htg. & Eng'g Co.

Masonic Temple
Oklahoma City, Okla.
A. F. Binns

National Bank of Commerce
Detroit, Mich.
Lorne Plg. & Htg. Co.

National City Co. 42nd St. Bank
New York City, N. Y.
Baker, Smith & Co., Inc.

New Santa Fe Office Bldg.
Topeka, Kans.
Simmons Plg. & Htg. Co.

New York Stock Exchange Annex
New York City, N. Y.
Mandel-McIver Co.

National Bank of The Republic
Chicago, Ill.
Narowetz Htg. & Vent. Co.

Occidental Insurance Co. Bldg.
Albuquerque, N. Mex.
Strumquist Engineering Co.

Olmstead Hotel
Rochester, Minn.
Geo. M. McGeary & Son

American Blower

"Sirocco" TRADE MARK

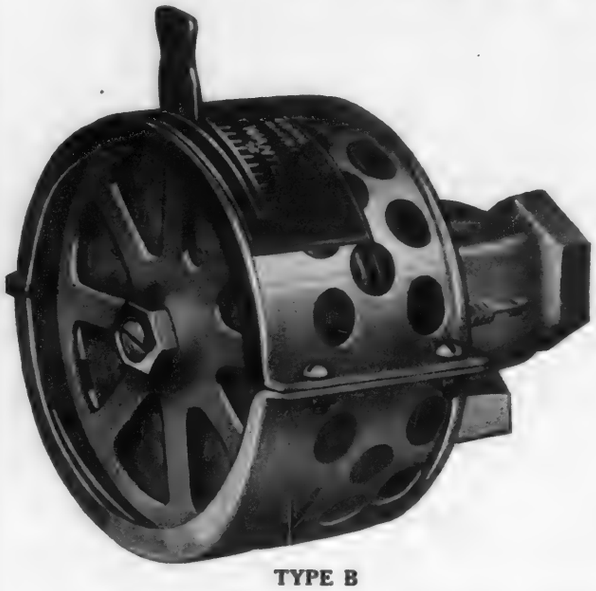
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

448

Sterlco
TRADE MARK

The Sterlco-Roys Thermotrol



TYPE B

The new model Type B Thermotrol controls room temperatures accurately.

Can be used at top or bottom of radiator.

Valve has universal connection for top, bottom, left or right connection.

No wall thermostats, air compressors or piping necessary.

Regulation secured through thermostatic action.

Write for Bulletin No. 38.

STERLING ENGINEERING COMPANY

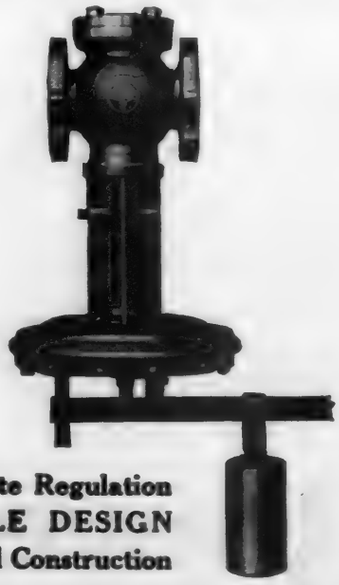
1626-40 Holton Street, MILWAUKEE, WIS.

USE A MASON

Lever Style Reducing Valve

on your next

HEATING CONTRACT



Accurate Regulation
SIMPLE DESIGN
Rugged Construction

MASON REGULATOR COMPANY

Boston, Mass. San Francisco, Cal. Montreal, Canada

Improved Rotary Type 22

This cut shows a complete installation of Underground Oil Storage Tank-Piping and Johnson Improved Rotary Oil Burners. Note—How Simple—and Safe. Can be readily installed in most any Boiler Heater or Furnace. Patented features of Centrifugal Atomization permit the cheapest grade Fuel Oil to be pumped and burned with high economy and satisfactory service—Listed as standard by Underwriters' Laboratories.

Write for Our Latest Bulletin No. 28D, describing and listing this Oil Burner Masterpiece.

Main Office and Factory
S. T. JOHNSON CO.,
OAKLAND, CAL.

Distributors and Branches
San Francisco, New York, Chicago, St. Louis, Philadelphia, Detroit, Dallas, Los Angeles, Indianapolis, Portland, Seattle, Milwaukee, Louisville, Bridgeport, Paterson, Sacramento, Buffalo, Toronto, Montreal, Cleveland, Hull, Fresno, Kansas City, Oklahoma City, Honolulu, Minneapolis, Washington, New Orleans, Miami.

From its own factory in Indianapolis thousands of new cylinders are shipped each year to its 31 plants manufacturing

Prest-O-Lite
DISSOLVED ACETYLENE

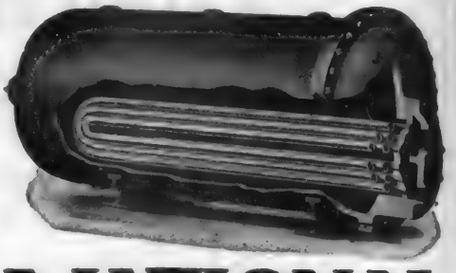
THE PREST-O-LITE COMPANY, INC.
Oxy-Acetylene Division
General Offices: Carbide & Carbon Bldg., 30 East 42d St., New York
In Canada: Prest-O-Lite Co. of Canada, Limited, Toronto
31 Plants—60 Warehouses—22 District Sales Offices

"Take it from one who knows"

"If you want to keep out of hot water give 'em a hot water service that's dependable and doesn't cost all outdoors to run or keep running.

"I always specify **National** Storage Heaters. They cost less to install, use live or exhaust steam and save coal, and provide A-1 hot water service under all conditions. Everybody's satisfied and I get the credit for being a heating engineer that knows his job."

Get Bulletin 65 for complete information.



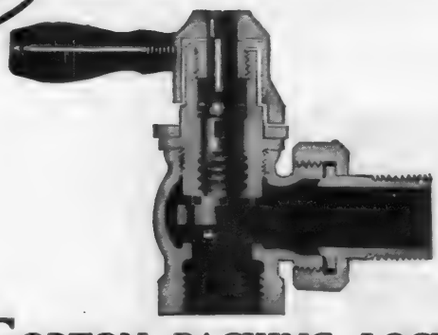
NATIONAL
U BEND TYPE
STORAGE HEATERS

The National Pipe Bending Company

120 RIVER STREET *Established 1883* NEW HAVEN, CONN.

Canadian Sales Representative: Grant E. Cole Company, Toronto, Ont. 8370

GORTON VALVES



GORTON PACKING LOCK MODULATING VALVE No. 8

Is the highest grade valve of its type—but is competitive in price. In design and construction it is the best in the field. We are prepared to prove this to your entire satisfaction.

The "PACKING LOCK" is patented and an exclusive feature with GORTON VALVES.

Used with the Sarco-Gorton System

Write for Bulletin No. 7 giving full details.

Gorton & Lidgerwood Co.

96 Liberty Street, New York, N. Y.

Established 1857. Representatives in Principal Cities.

ROSS
Crosshead-
GUIDED
Expansion Joint
Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

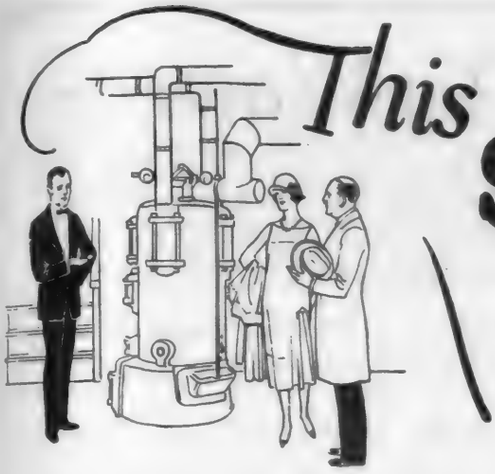
ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.

New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

ALBERGER BUFFALO HEATERS

Alberger Heaters are known the country over for efficient heat transmission, unusual accessibility and reliable service.

ALBERGER HEATER CO. 291 Chicago St.
HOWARD IRON WORKS Buffalo, N. Y.



This salesman will sell for you without pay

Owner: "This regulator saved me 200 trips to the basement last winter."

Friend: "Pretty soft for you! Tell me who installed your boiler. I want to see him."

HE'S a happy *owner* for whom you have installed a hot-water boiler with an Arco Water Regulator.

Result? His boiler performs better, of course, and saves him a lot of "fussing" with dampers.

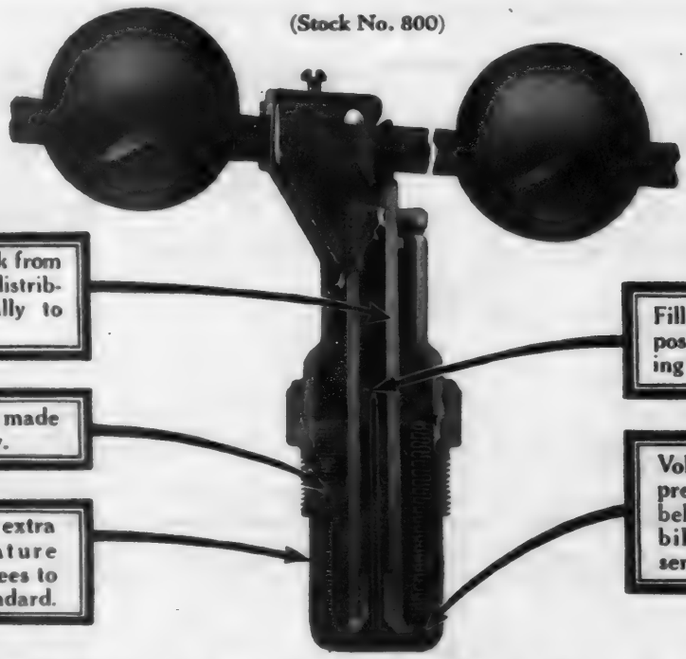
So he tells his friends about it—takes them down cellar to see it.

Then they ask him who installed it—and you know the rest.

We know some very successful heating merchants who are cashing in on this free salesmanship.

One of the merchants said, "I always put an Arco Regulator on a hot-water job, even if I have to donate it. Every boiler I equip with automatic regulation, *sells* another job for me."

(Stock No. 800)



Stem transfers work from bottom of bellows distributing travel equally to each fold.

One piece bellows made in our own factory.

Design provides extra long temperature range—100 degrees to 220 degrees standard.

Filling tube provides positive method of sealing liquid chamber.

Volatile liquid develops pressure on outside of bellows. Gives durability, accuracy and sensitiveness.

The ARCO WATER REGULATOR

You can get ARCO Water Regulator from your jobber or from our nearest branch

AMERICAN RADIATOR COMPANY

IDEAL Boilers, AMERICAN Radiators, ARCO Valves and Regulators

1807 Elmwood Avenue Dept. S Buffalo, N. Y.

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

Erie, Pa.

A good place to live, to work and to play.

Send best price on

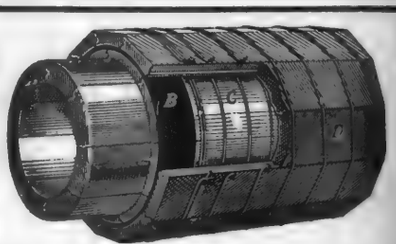
- Reducing Valves
- Temperature Regulators
- Pump Governors
- Balanced Valves
- Thermostats
- Damper Regulators
- Float Valves
- Swing Joint Fittings
- Bronze Unions

Standardization and large output enable us to put a low price on very high quality products. Write your name and address on the margin of this page, mail to us, and we will send complete information.

The above is VICTOR No. 3; for pressures up to 250 lbs.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 SOUTH ST., NEWARK, N. J.

Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

KIELEY
REGISTERED TRADE MARK

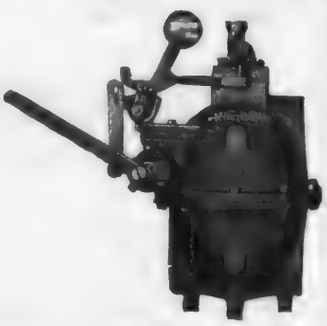
Steam, Water and Air Specialties

Non-Return, Easy Repair Trap

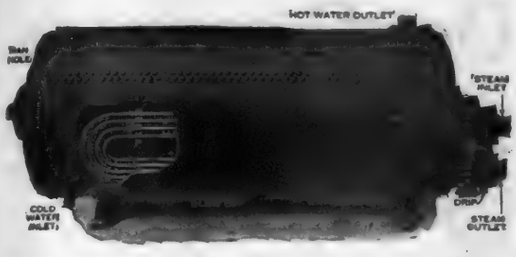
Manufacturers of the Complete Line

Send for Catalog 1923

KIELEY & MUELLER, Inc.
Main Office and Works
34-38 West Thirteenth Street
New York, N. Y.



Pump and Lift Trap



Patterson Combined Hot Water Service and Storage Heater—Type B.

Ready for Sudden Heavy Demands

This heater is adaptable to:

- Clubs
- Hotels
- Apartment Houses
- Association Buildings
- Institutions
- Bleacheries
- Dye Houses
- Canning Plants
- Laundries
- Paper and Pulp Mills
- Textile Plants
- Industrial Plants, etc.

Where the demands for hot water are not constant or where a large volume of water must be held in storage for sudden, heavy demands, the Patterson Combined Hot Water Service and Storage Heater fills the requirements. It operates with either live or exhaust steam—high or low pressure—automatically controlled, or in connection with low pressure, vacuum or vapor heating systems.

Our Engineering Service is offered without obligation, and the requirements of each installation are considered carefully before making recommendation as to type or capacity of the heater to be used.

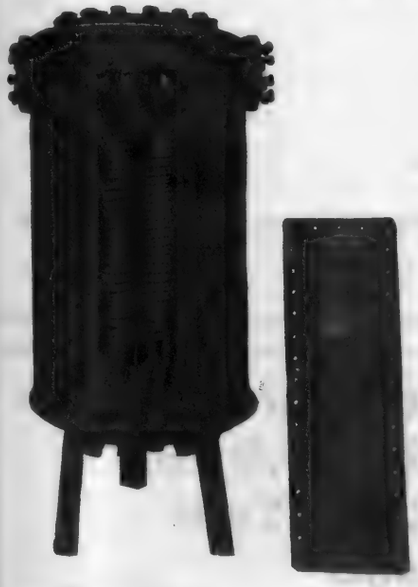
Where installations are made in accordance with our recommendations, we positively guarantee satisfactory hot water service.

Patterson-Kelley Co.,

Water Heating Engineers

107 E. 40th St. **New York**

Hotter Water with Less Fuel—



The Reilly Water Heater

has the highest rate of heat transfer of any closed heater on the market. Besides its unequalled efficiency, several special features of construction make it the best heater for dependable year-in, year-out, service.

Every coil and joint of the Reilly Water Heater can be inspected and made tight *while under pressure and without breaking any pipe joint* —an exclusive Reilly Heater feature.

Expansion strains on headers or tubes are prevented by the spring-like crimped coils—another exclusive Reilly Heater feature.

Send the coupon for complete information

The Griscom-Russell Company

2155 West Street Building, New York

Philadelphia	Chicago	St. Louis	San Francisco
Boston	Cleveland	Kansas City	Los Angeles
Rochester	Detroit	Charlotte	Seattle
Pittsburgh	Milwaukee	New Orleans	Denver
Columbus	Indianapolis	Houston	Salt Lake City
	Minneapolis	Dallas	Tulsa

For Canada: Riley Engineering and Supply Co., Ltd., Toronto

NAME .....

COMPANY .....

ADDRESS .....

The Griscom-Russell Company, 2155 West Street Building, New York. Send me at once without charge a copy of your bulletin describing the Reilly Water Heater.

H&VM.8-25

20,000 holes!

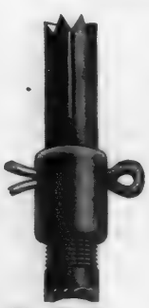
¾ to 1½ inches diameter
2 to 4 inches deep—
IN CONCRETE CEILINGS

is one of the jobs now being drilled with **PHILLIPS SPRING HAMMER DRILLS** by the Grinnell Co., Inc., installing Automatic Sprinkler System in the new Sears-Roebuck plant at Kansas City.

The M. H. Crane Estate, heating contractors on the same building, are using **PHILLIPS DRILLS** on **4,000 HOLES**, 400 of them being ⅞-in. diameter through 6 to 9-in. thick floor slabs. A. McKinley P. & H. Co., plumbing contractors, and Alvey Mfg. Co., mfrs. of conveying machinery, are also users of **PHILLIPS DRILLS** on this same job.

PHILLIPS SPRING HAMMER DRILLS are recommended to heating, sprinkling, plumbing, electrical, millwrighting and general contractors, and industrial plants, as the most satisfactory and economical tools for drilling **UPWARD HOLES** in concrete ceilings and through floors.

Typical way of drilling holes upward in concrete ceilings and through floors. Also installing **SELF-DRILLING EXPANSION SHELLS.**



Pipe Hanger Shell

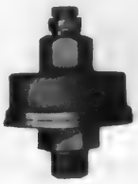
Rod Hanger Shell

Strap Hanger Shell

PHILLIPS SELF-DRILLING EXPANSION SHELLS are recommended for fastening pipe and other hangers and apparatus to concrete ceilings, walls and floors. **EVERY SHELL IS A DRILL**, and a new sharp drill for every hole means absolute economy in time and labor installing. Right in principle it makes a neat fitting hole, then enlarges the hole at bottom and is expanded hard and tight in the enlarged hole.

PHILLIPS DRILL COMPANY
1537 Cortland Street
CHICAGO, ILLINOIS

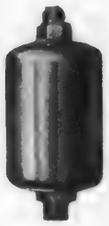
Our Guarantee



All Stay-Rite Heating Specialties operate properly and assure long service. And to substantiate our claim for high efficiency, we gladly offer a liberal guarantee, of which the following is an example:

"Should any Ideal Stay-Rite Specialty show defects in manufacture or fail to operate in a satisfactory manner, at any time within five (5) years from date of installation, new traps or parts will be supplied without charge."

Send for prices and full details about the Stay-Rite Line.



The Ideal Heating Equipment Co.
1250 West 4th Street CLEVELAND, OHIO

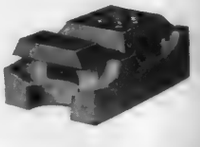
Crescent Air Duct Thermometer

A standard type of Crescent Thermometer specially designed for both warm and cold air ducts. 9 or 12 inch scale graduated as required. Union Flange and stem of required length. Guaranteed accurate and reliable. Prices and Air Duct Bulletin F-14 on request.

AMERICAN SCHAEFFER & BUDENBERG CORP.
BROOKLYN, N. Y.
*Boston *Chicago Detroit Tulsa
Buffalo Cleveland *Los Angeles Philadelphia
*Pittsburgh Salt Lake City *Seattle
*Stock carried at these branches

Investment of $675 Yields $1,866.71 Each Year

PYRAMID GRATES DID it. Write for details.



PYRAMID IRON PRODUCTS CO.
136 Liberty Street New York City

KENNEDY

Standard Gate Valves

Fig. 57

The Kennedy Standard Valve is the standard in installations all over the country. On steam, water, air, oil, gas and chemical pipe lines, it has been proving its thorough-going and lasting merit for almost half a century.

Kennedy Standard Valves thirty and forty years old or more are still serving on many a pipe line, too good to be replaced.

These valves are built in a wide range of sizes, with both stationary and outside rising stem, and both screwed and flanged ends. They are described in the Kennedy Catalog, together with the entire Kennedy line of over 4600 different types and sizes. Send for your copy.

THE KENNEDY VALVE Mfg. Co., ELMIRA, N.Y.

Branch Offices and Warehouses
NEW YORK: 128-132 White St.
SAN FRANCISCO: 448-450 Tenth St.
BOSTON: 47 India St.
CHICAGO: 228 N. Jefferson St.

Sales Offices:
SALT LAKE CITY
EL PASO
SEATTLE
KANSAS CITY, MO.
LOS ANGELES
PHILADELPHIA
MIAMI
CLEVELAND

IRON BODY GATE VALVES

SCREWED, FLANGED AND HUB END STYLES

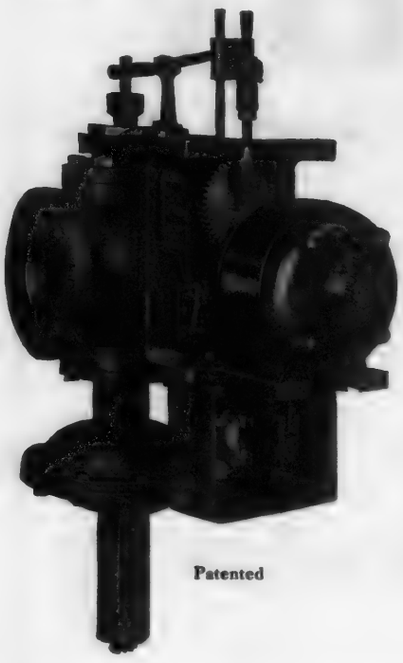
NON-RISING STEM AND O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway Chicago, Ill.

3190



Patented

"Master Control" Valve

New Thermostat makes possible a simplified construction

The Automatic Switch Control Box is now made a part of the motor bracket unit, because the new Thermostat being suitable for contacting on either 110 or 220 volts direct no low voltage transformer is required.

Armored cable is used to connect thermostat to motor switch, making this installation most desirable in Industrial Buildings, Stores, Offices, Schools, Hospitals, etc.

The method of construction heretofore used will be continued, for use in such places as residences, where the running of armored cable might be less desirable than that of the low voltage thermostat cord.

Either style of "Master Control" is sold on a sixty days' trial basis.

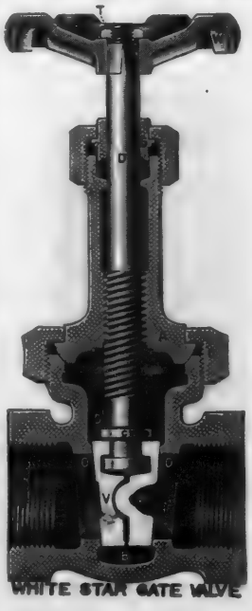
Ask for Bulletins and complete information about this efficient heat controlling system.

Heat Loss is Money Loss

Central Heat Appliances, J. C. Hornung Engineer **343 So. Dearborn St., Chicago**

Equally Dependable

for STEAM, WATER, GAS, OIL or AIR



WHITE STAR GATE VALVE

Fig. 375

POWELL White Star Gate Valves

DOUBLE WEDGE DISCS AND SEAT RINGS OF WHITE "POWELLIUM" NICKEL.

Steam Working Pressure up to 200 Pounds.

Order from Your Dealer
Write us for information

THE WM. POWELL CO.

Dependable Engineering Appliances

CINCINNATI OHIO

THERE are several good makes of pressure regulators. If the make you have been using is giving perfect satisfaction, keep on using it. If not, advise using Davis on your next job.

G. M. DAVIS REGULATOR CO.,
436 Milwaukee Ave., Chicago, Ill.

1875—Valve makers for fifty years—1925

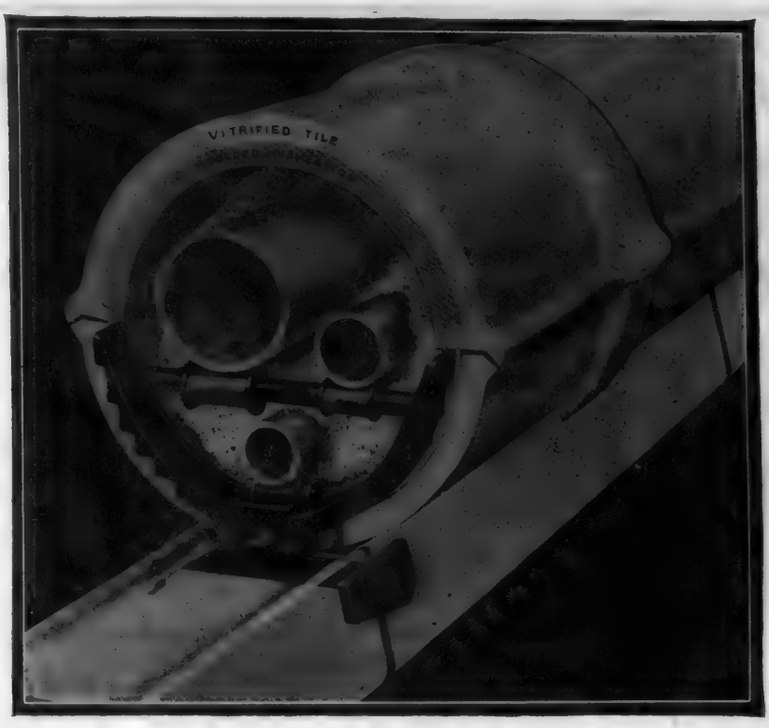
DAVIS VALVE SPECIALTIES

STEAM SAVERS SINCE 1875

Piston type pressure regulator with counterweighted lever control. Pressure is balanced by weight. Action is visible and may be tested by hand. No diaphragm to give way—no packings to cause friction—no gasket to blow out—no springs to lose their power. These advantages recommend the Davis Pressure Regulator for long dependable service.

Pressure Regulator

HV-8B-RTG.



The safe external pipe support

carries pipes independent of conduit

RIC-WIL Pipe Supports are free of all the weaknesses of the internal type of pipe support.

As the illustration above shows, the burden of the pipes is carried independent of the tile conduit. The rollers and the strong cast-iron supports rest on the heavy cast-iron saddles wedged between two sections of base drain as solidly as if set in concrete.

No amount of expansion or contraction of the pipes, of sudden or heavy movement, can disturb these Ric-wiL Supports. This makes the tile conduit safe from breaking open.

In this and in every other detail, Ric-wiL is made permanently efficient by progressive modern engineering

THE RIC-WIL COMPANY, Cleveland, Ohio

Two Dangers!

Two dangers lie in any internal pipe support: the weight and movement of pipes on the inverted arch of the tile conduit is likely to break it down and cause leakage; also it is difficult if not impossible to make the support rigid enough so it will not upset.

RIC-WIL

UNDERGROUND CONDUIT

Wainwright Hot Water Heater for Heating Systems

Two special 500 sq. ft. Wainwright Heaters in the Naumkeag Mills, Salem, Mass.

HOT water heating is especially adapted for use with exhaust steam from engines or turbines.

Widely distributed buildings can be heated from a central plant.

Accurate, graduated temperature control is obtainable.

Write for Bulletin H-6.

WHEELER CONDENSER & ENGINEERING CO.

149 Broadway, New York

Works - CARTERET, N.J., NEWBURGH, N.Y.

E-Z RADIATOR HANGER

YOU'LL USE 'EM YET!

No dirt under radiators hung from wall with **E-Z Hangers.** Easy to clean under. Pleases your customer.

Write for ALL the advantages.

HEALY-RUFF CO.
772 Hampden Ave.,
St. Paul - - Minn.

YEOMANS

YEOMANS PUMPS GIVE YEOMAN SERVICE

HORIZONTAL AND VERTICAL AUTOMATIC ELECTRIC

Condensation Pumps

A thorough investigation of this pump will reveal the best material, the finest workmanship, resulting in a noiseless, rugged, reliable product that will give dependable service for many years.

For automatically returning condensation to boilers from low pressure gravity steam heating systems.

Also manufacturers of Bilge Pumps, Centrifugal Pumps, Sewage Ejectors, Sewage Pumps, etc.

Engineers and architects may for the asking receive our condensation bulletin.

YEOMANS BROTHERS COMPANY
1421 Dayton St., Chicago

BADGER

Permanency

A big factor in economy lies in the amount of attention required by an installation after it has been made.

Badger Self-Equalizing Expansion Joints are economical because they make a permanent job. A one-piece joint, easily bolted in place, no packing or adjusting to be made, possibility of leaks eliminated—no further attention.

Engineers who know **Badger Expansion Joints** feel safe in recommending them because, in addition to quality, they are sure of an efficient engineering service in selecting the right joint for each **Badger** installation.

Eighty-three years in the manufacture of metal specialties enables us to offer this service, and without obligation. Let our engineers help you.

E. B. BADGER & SONS COMPANY

75 PITTS STREET, BOSTON, U. S. A.

Branch Offices in Principal Cities

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.

Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Fleisher Co., Inc., W. L. New York.
Grinnell Company, Providence, R. I.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

AIR COOLING AND DRYING SYSTEMS.

Aerofin Corp., Newark, N. J.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Fleisher Co., Inc., W. L., New York
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

AIR ELIMINATORS.

Jas. P. Marsh & Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Midwest Air Filters, Inc., New York.

AIR FILTERS.

Midwest Air Filters, Inc., New York.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.

AIR SEPARATORS.

Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., Inc., New York.
Fleisher Co., Inc., W. L. New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

BLOWERS

Fan.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

Pressure.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

BOILER CEMENT.

Johns-Manville, Inc., New York.

BOILERS.

Down-Draft.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
General Boilers Co., Waukegan, Ill.
Hart and Crouse, Utica, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Universal Smokeless Boiler Co., Ravenna, O.

Heating.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Burnham Boiler Corp., Irvington, N. Y.
Continental Heater Corp., Dunkirk, N. Y.
Cox Stove Co., Abram, Philadelphia, Pa.
Frost Mfg. Co., Chicago, Ill.
General Boilers Co., Waukegan, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Gurney Heater Mfg. Co., Boston, Mass.
Handon Boiler Corp., New York.
Heggie Simplex Boiler Co., Boston, Mass.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Niagara Radiator & Boiler Co., North Tonawanda, N. Y.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., Newark, N. J.
Titusville Iron Works, Titusville, Pa.
Universal Smokeless Boiler Co., Ravenna, O.
Utica Heater Co., Utica, N. Y.
Weil-McLain Co., Chicago, Ill.

Power.

Frost Mfg. Co., Chicago, Ill.
Heggie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York.

COILS, PIPE.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

Air.

New York Blower Co., Chicago, Ill.

CONDENSERS.

Alberger Heater Co., Buffalo, N. Y.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Wyckoff & Son Co., A., Elmira, N. Y.

COOLERS.

Oil.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS.

Badger & Sons Co., E. B., Boston, Mass.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS.

Dahlquist Mfg. Co., Boston, Mass.

COPPER KETTLES.

Dahlquist Mfg. Co., Boston, Mass.

COVERING PIPE.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A, Elmira, N. Y.

DAMPERS, DUCT.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
York Heating & Ventilating Co., Philadelphia, Pa.

DEHUMIDIFYING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Fleisher Co., Inc., W. L., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.

DRAFT APPLIANCES.

Crown Fuel Saver Co., Richmond, Ind.
Wolff Coal Saver Co., Chicago, Ill.

DRYING SYSTEMS.

(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

DUST COLLECTORS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F. Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

DUST DETERMINATORS.

Atmospheric Conditioning Corp., Phila., Pa.

ENGINES.

Steam, Automatic.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.

Hoffman Specialty Co., New York.

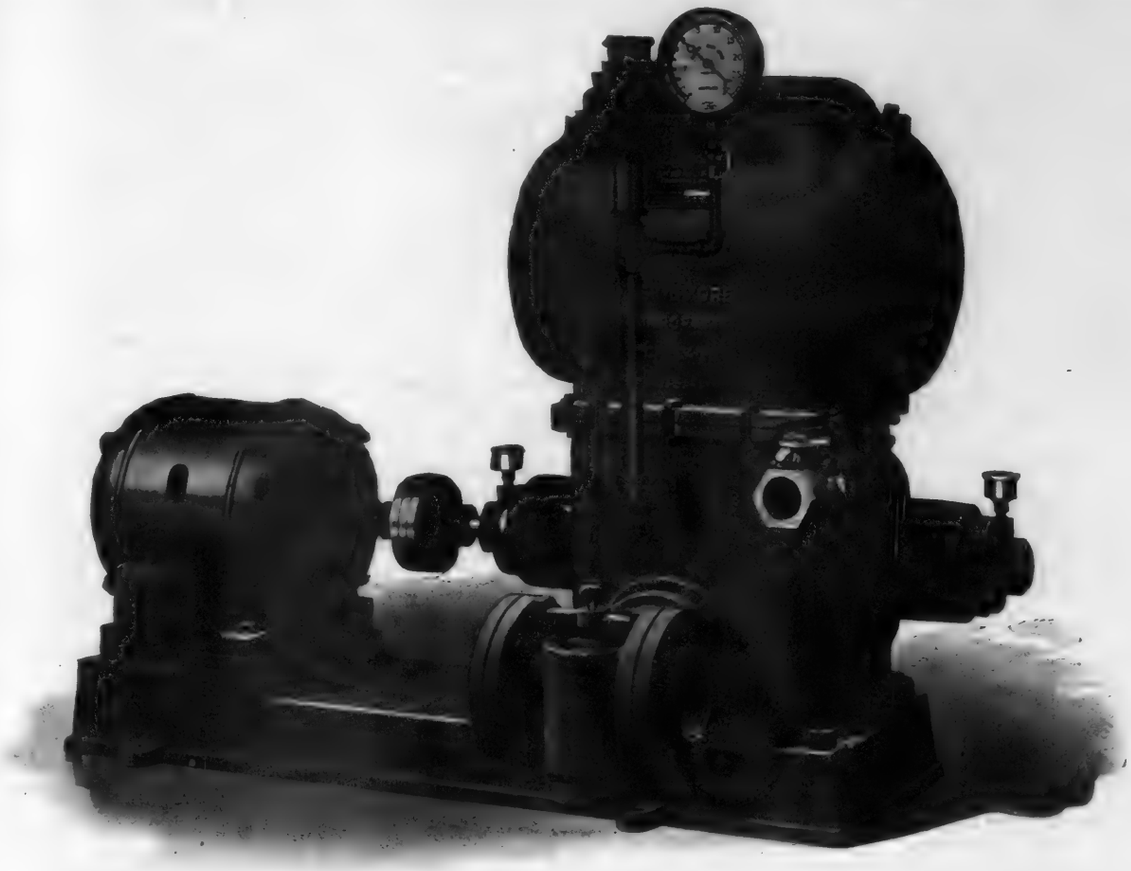
EVAPORATORS.

Boiler Feed Make-Up.

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

EXHAUST HEADS.

Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wright-Austin Co., Detroit, Mich.



The New Type "B"

A NEW design, more sturdy and compact, retaining all the advantages of our well known Return Line Vacuum and Boiler Feed Pumps.

Material and workmanship are of the same high standard.

The bronze vacuum rotor and centrifugal pump impeller are carried on high carbon steel shaft protected by phosphor bronze sleeves, now recognized by engineers as the highest grade of construction.

The motor and pump are mounted on one piece cast-iron base, with drip pan cast integral, tapped for drip connection.

Built in seven sizes for 10 to 60 lbs. pressure to handle 5,000, 8,000, 16,000, 26,000, 40,000, 65,000 and 100,000 sq. ft. of radiation for continuous service or automatic control.

READY FOR SEPTEMBER FIRST DELIVERY

SKIDMORE CORPORATION

General Office and Factory

1535 DAYTON STREET CHICAGO, U. S. A.

ENGINEERS' SPECIFICATION INDEX (Continued)

EXHAUST SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

EXPANSION JOINTS.

American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS

Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.

Amercan Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

FEEDERS

Boiler

Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.

FILTERS, (Aerating).

Griscom-Russell Co., New York.

Feed-Water.

Elliot Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.

American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.

FLANGES.

American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

GAS BURNERS

Cleveland Gas Burner & Appliance Co., Detroit, Mich.

GASKETS, METALLIC.

Sarco Co., New York.

GAUGE BOARDS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GAUGES.

Altitude.

Pierce, Butler & Pierce Corp., New York.

Draft.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.

Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.

American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Bishop & Babcock Co., Cleveland, Ohio.

Vacuum.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).

Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Corp., New York.

Water.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).

Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES

Dumping

Pyramid Iron Products Co., New York.

Rocking

Pyramid Iron Products Co., New York.

Shaking

Pyramid Iron Products Co., New York.

Shaking and Dumping

Pyramid Iron Products Co., New York.

Shaking, Circular

Pyramid Iron Products Co., New York.

Stationary

Pyramid Iron Products Co., New York.

HEATERS.

Domestic Water.

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Burnham Boiler Corp., Irvington, N. Y.
Dahlquist Mfg. Co., Boston, Mass.
Everhot Heater Co., Detroit, Mich.
Excelso Specialty Works, Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Electrical Unit

Ilg Electric Ventilating Co., Chicago, Ill.

Feed Water, (Closed).

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).

Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.

Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air, Fan System.

Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit Air.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Supreme Heater & Ventilating Corp., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.

"Gasteam".

James B. Clow & Sons, Chicago, Ill.

Vacuum.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Vapor.

American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane & Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Water.

Grinnell Company, Providence, R. I.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.

American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Atmospheric Conditioning Corp., Phila, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INSTRUMENTS

Electric Measuring.

Bristol Co., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass.

A Scientific Method of Burning Coal and Coke

Any heating engineer who is interested in saving coal and getting more heat for himself or for his clients can test the CROWN Fuel Saver at small expense.

Write for full details of this wonderful coal-saving device and for low demonstration price. We have such absolute confidence in the CROWN that we guarantee to return every penny of the small purchase price if the CROWN does not make

A coal-saving of at least 20%

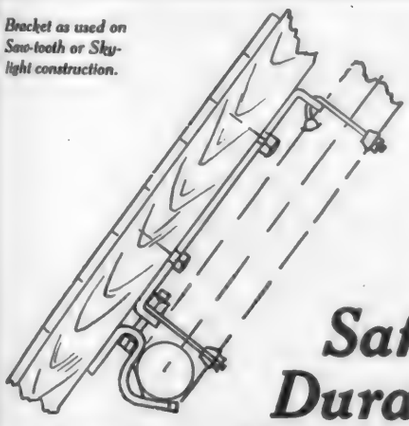
Crown Fuel Saver Co., 70 N. 10th St., Richmond, Ind.

CROWN FUEL SAVER

and SMOKE *Consumer*

Fits the Feed Door of Any Heating Plant

Bracket as used on Saw-tooth or Sky-light construction.



No. 2 for Horizontal Wall Radiators

Safe Durable Convenient

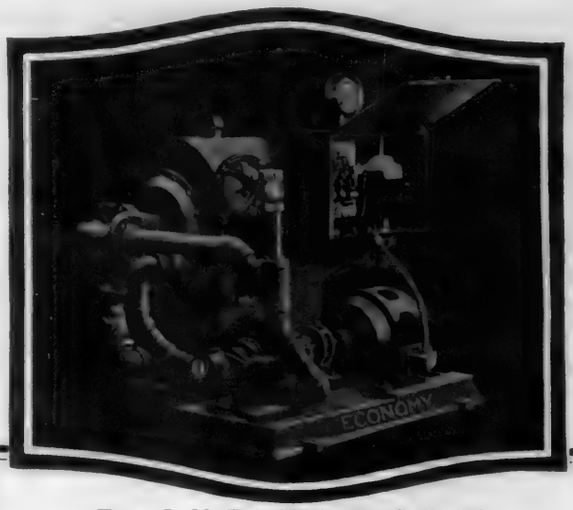
These qualities are built into Gleockle Wall Radiator Brackets because they are made by men who know bracket requirements.

They are also adjustable, easy to erect, inexpensive, invisible after erection, and will fit any make of wall radiator.

Patented

Let us send you descriptive booklet and trade discounts

A. F. GLEOCKLE, Jr. 415 Bay Street ROCHESTER, N. Y.



Type C. V. Fig. 2234—Single Model Vacuum Pumps

DEPENDABILITY

This is an essential requirement of all apparatus entering into the equipment of every worth while project.

Economy Centrifugal Vacuum Pumps

embody every requisite of high class equipment. They are well motored with ample reserve power. They never burn out, consequently shut downs are avoided.

They have ample air, water and pressure capacity.

They have longer life than other types.

They maintain their efficiencies.

They are scientifically designed.

They have the best thought of competent hydraulic and heating engineers built into them.

They require less attention and upkeep than other types.

They reduce noise in radiators and piping.

They operate quietly.

They use no more power than other pumps that do the same work.

They are guaranteed for performance and quality.

Representatives in Every Large City

Economy Pumping Machinery Co.

71-122 North Curtis St. CHICAGO

ENGINEERS' SPECIFICATION INDEX (Continued)

Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Union Fibre Co., Winona, Minn.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Flow

American District Steam Co., North Tonawanda, N. Y.
Spray Engineering Co., Boston, Mass.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

NOZZLES, SPRAY

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Co., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Manufacturing Co., Milwaukee, Wis.
Carrier Air Conditioning Co. of America, Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

OIL BURNING EQUIPMENT

Johnson Co., S. T., Oakland, Cal.

OZONE APPARATUS.

United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Steel.

National Tube Co., Pittsburgh, Pa.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yoemans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeannette, Pa.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR BUSHINGS.

Metering.

Holley Mfg. Co., Virginia, Minn.

RADIATOR HANGERS.

Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Healy-Ruff Co., Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Lyon Products Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York,

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Kieley & Mueller, Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Wright-Austin Co., Detroit, Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Co., H. W., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indiapapolis, Ind.
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeannette, Pa.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn,
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

SEPARATORS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Massachusetts Blower Co., Watertown, Mass
Seymour, James M., Newark, N. J.

SPRAY NOZZLES

(See Nozzles, Spray)

SPRINKLER HEADS

C. S. B. Sprinkler Co., Boston, Mass.

STRAINERS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Kieley & Mueller, Inc., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.

Pipe

Spray Engineering Co., Boston, Mass.

Steam.

American Dist. Steam Co., No. Tonawanda, N. Y.
Dunham Co., C. A., Chicago, Ill.
Eliott Co., Jeannette, Pa.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis.
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sarco Co., New York.
Spray Engineering Co., Boston, Mass.

THERMOMETERS.

(Recording and Indicating).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn,
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.

"CHICAGO" PUMPS

Give You
HIGH QUALITY at a REASONABLE COST

"SURE RETURN" CONDENSATION PUMP
Ask for Bulletin 47.

The best workmanship and finest materials obtainable are used in building "Sure Return" Condensation and "L-1" Bilge Pumps — yet we are able to sell them at very low prices.

Hundreds of each size are put through our modern shop at one time—but each unit gets individual care and inspection. Thus you are assured of a reasonably-priced, proper working outfit.

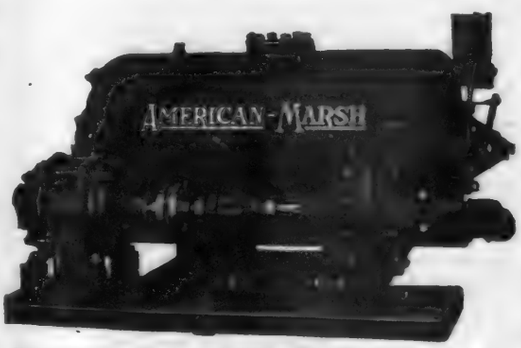
Try a "Chicago" pump on your next hard job. You will like the result.

"L-1" BILGE PUMP
Ask for Bulletin 48

CHICAGO PUMP CO.

2332 Wolfram Street — Chicago, Ill.

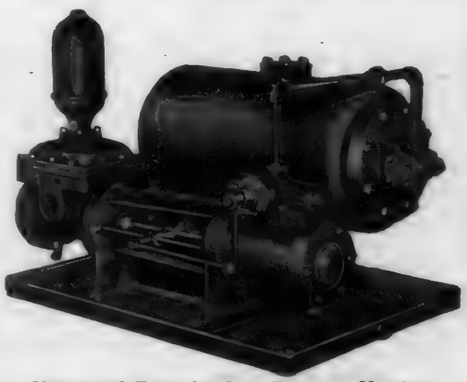
AMERICAN-MARCH Condensation Pumps for Heating Systems



Horizontal Type for Low Pressure Heating Systems, Motor Driven.

The Line Includes

- Boiler Feed Pumps
- Vacuum Pumps, steam and motor driven
- Hot Water Circulating Pumps
- Sump or Bilge Pumps
- Condensation Pumps, steam and motor driven, vertical and horizontal
- Automatic Boiler Feed Pumps and Receivers.



Horizontal Type for Low Pressure Heating Systems. Steam Driven.

The demand for dependable and efficient pumping equipment for heating systems is being met by the American-Marsh Condensation Pump. These pumps are developed in both steam and motor driven, in either vertical or horizontal types. American-Marsh Condensation pumps are delivering the highest type of service in every pumping capacity. Let our engineers solve your pumping problems. Get the installation that meets your exact requirements.

WRITE FOR BULLETINS

AMERICAN STEAM PUMP COMPANY
BATTLE CREEK, MICHIGAN

ENGINEERS' SPECIFICATION INDEX (Continued)

Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.

TRAPS.

Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeannette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Bic-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

VALVES.

Air (Automatic).

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

Air Relief.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.

Elliott Co., Jeannette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

Check.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Float.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.

American District Steam Co., No. Tonawanda, N. Y.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Globe, Angle and Cross.

Commonwealth Brass Corp., Detroit, Mich.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.

Hydraulic-Operating.

Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
Klippel Mfg. Co., Chicago, Ill.

Non-Return.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Radiator.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

Regulating.

American District Steam Co., No. Tonawanda, N. Y.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Relief (Water).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.
(See Valves, Non Return).

VENTILATING HEATERS

Portable Unit.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Peerless Unit Ventilating Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.
(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

VENTILATORS.

Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Mushroom.

Knowles Mushroom Ventilator Co., New York.
Lyon Products Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

WEATHER STRIPS.

Metal.

Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.
Monarch Metal Products Co., St. Louis, Mo.

WELDING MATERIALS.

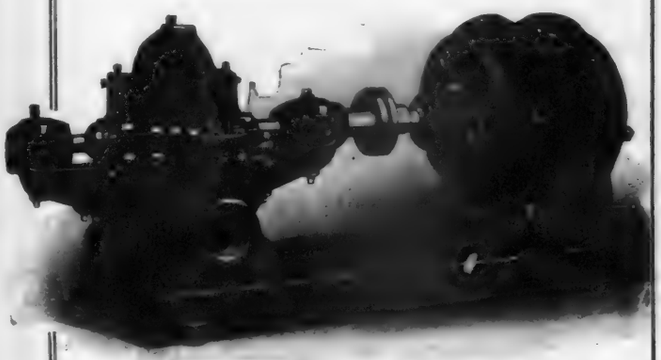
Linde Air Products Co., New York.
Oxweld Acetylene Co., Long Island City, N. Y.
Prest-O-Lite Co., Inc., New York.

"Buffalo" Class "S" Pumps stay on the job

Air washer manufacturers and heating contractors use more Buffalo Class "S" pumps than any other make.

This is because they have found Buffalo Pumps "long-lived" as well as efficient.

This popularity has enabled us to reach a production large enough to make the price of Class "S" pumps surprisingly low.



1. **Casing:** Horizontally divided; mounted directly on base. Interior can be inspected without breaking pipe connections.
2. **Impeller:** Enclosed double suction type, hydraulically balanced.
3. **Clearance Rings:** Brass. Furnished in casing. Easily renewable.
4. **Shaft Bearings:** Ring oiling, horizontally split housings. Brackets bolted to casing, one on each side.
5. **Thrust Bearings:** Collars in each bearing of smaller pumps, marine type on larger sizes.
6. **Stuffing Boxes:** Extra deep. Brass bushed in smaller sizes.
7. **Glands:** Bolted type.
8. **Water Seals:** Brass. Furnished in each stuffing box. Connections cast in casing in smaller sizes.

We are glad to have you compare specifications of Buffalo Pumps with any others.

Bulletins on request.

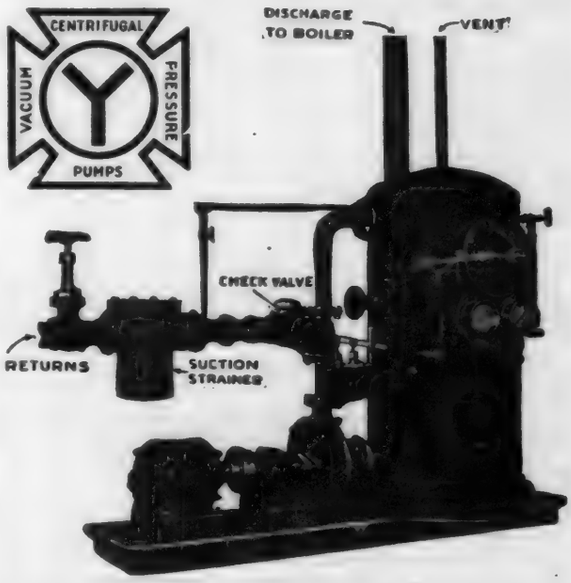
Buffalo Steam Pump Company

480 Broadway BUFFALO, N. Y.

YOUNG

Vacuum and Boiler Feed

PUMPS



Supplied in standard units of six capacities

We furnish Young Centrifugal Vacuum and Boiler Feed Pumps in six capacities, ranging from 5,000 to 65,000 square feet of direct radiation. Standard Units V1, V2, V3, V4 and V5 are built to discharge against a pressure of not more than 20 pounds at the pump. Standard Unit V0 is built to discharge against 18 pounds pressure at the pump. (We also make *special* pumps of these same unit numbers to discharge against 35 pounds.) Both standard and special units are furnished for either continuous or automatic control. The air and water capacity of all Young Pumps are more than ample for the operating requirements of a vacuum heating system.

For Bulletins address:

YOUNG PUMP COMPANY

230 EAST OHIO STREET, CHICAGO

FACTORY: MICHIGAN CITY, INDIANA

ALPHABETICAL INDEX TO ADVERTISEMENTS

A

Aerofin Corporation 122
Alberger Heater Co. 132
American Blower Co. 129
American District Steam Co. 29
American Radiator Co., 27, 33, 133
American Schaeffer & Budenberg Corp. 136
American Steam Pump Co.. 147
Ames Iron Works 12
Athey Co. 118
Atlas Valve Co. 134
Atmospheric Conditioning Corp. 116
Autovent Fan & Blower Co. 107

B

Badger & Sons Co., E. B... 141
Barnes & Jones 26
Bayley Mfg. Co. 35
Bishop & Babcock Co..... 39
Bristol Co. 126
Brownell Co. 112
Bryant Heater & Mfg. Co... 16
Buckeye Blower Co. 117
Buffalo Forge Co. 123
Buffalo Steam Pump Co.... 149
Burnham Boiler Corp. 10

C

Carrier Air Conditioning Co. of America 123
Carrier Engineering Corp... 122
Cashin Co., W. D..... 32
Central Station Steam Co... 122
Chamberlin Metal Weather Strip Co. 127
Chicago Pump Co..... 147
Clarage Fan Co. 2
Cleveland Gas Burner & Appliance Co. 22
Clow & Sons, James B.... 14
Commonwealth Brass Corp. 38
Continental Heater Corp.... 23
Cox Stove Co., Abram.....40, 41
Crown Fuel Saver Co..... 145
C. S. B. Sprinkler Co..... 124

D

Dahlquist Mfg. Co. 8
Daniels, Ara Marcus..... 118
Davis Regulator Co., G. M.. 138
Dunham Co., C. A. 24
Dwyer Equipment Co..... 114

E

Economy Pumping Machinery Co. 145
Elliott Co. 31
Everhot Heater Co..... 20
Excelso Specialty Works, Inc. —

F

Foxboro Co., Inc., The..... 124
Frost Mfg. Co. 21
Fulton Co. 111

G

General Boilers Co..... 4
Gleockle, Jr., A. F..... 145
Gold Car Heating & Lighting Co. 118
Gorton & Lidgerwood Co.... 132
Grinnell Co. 113
Griscom-Russell Co. 135
Gurney Heater Mfg. Co.... 6

H

Haines & Co., Wm. S..... 28
Handon Boiler Corp. 19
Hart & Crouse Co..... 15
Healy-Ruff Co. 140
Heggie Simplex Boiler Co... 46
Higgin Mfg. Co. 116
Hoffman Specialty Co. 152
Holley Mfg. Co..... 122
Hornung, J. C. 138

I

Ideal Heating Equipment Co. 136
Ilg Electric Ventilating Co., Front Cover
Illinois Engineering Co.... 37
Illinois Malleable Iron Co... 137
International Heater Co..... 9

J

Jenkins Bros. 38
Johns-Manville, Inc..... 109
Johnson Co., S. T..... 130
Johnson Service Co. 48

K

Kennedy Valve Mfg. Co.... 137
Kewanee Boiler Co. 5
Kieley & Mueller, Inc..... 134
Klipfel Mfg. Co. 36
Knowles Mushroom Ventilator Co. 116

L

Linde Air Products Co..... —
Lyon Products Co. 120

M

Marsh & Co., Jas. P..... 3
Marsh Valve Co. ..... —
Mason Regulator Co. 130
McAlear Mfg. Co..... 30
McDonnell & Miller..... 12
Midwest Air Filters, Inc... —
Milwaukee Valve Co. 42
Minneapolis Heat Regulator Co. 126
Mouat Vapor Heating Co... 33
Mueller Co. 115

N

Nash Engineering Co..... 106
National Pipe Bending Co.. 132
National Regulator Co..... 33
National Tube Co. 18
Nelson Corp., Herman.... 45
Nesbitt, Inc., John J..... 125
New York Blower Co..... 110
Niagara Radiator & Boiler Co. 8

O

O-E Specialty Mfg. Co.... 32
Oil City Boiler Works..... 3
Oxweld Acetylene Co. 34

P

Page Boiler Co., Wm. H... 13
Patterson-Kelley Co. 135
Pecco Incorporated 120
Peerless Unit Ventilating Co. 120
Phillips Drill Co. 136
Pierce, Butler & Pierce Mfg. Co. 12
Powell Co., Wm. 138
Powers Regulator Co..... 105
Prest-O-Lite Company, Inc.. 131
Pyramid Iron Produts Co... 136

R

Reed Air Filter Co., Inc.... 121
Ric-wiL Co. 139
Ross Heater & Mfg. Co..... 131

S

Sarco Co. 26
Scott Valve Co..... 128
Seymour, James M. 116
Simplex Heating Specialty Co. 34
Sims Co. 134
Skidmore Corp. 143
Spray Engineering Co. 108
Stanwood Corp. 17
Sterling Engineering Co.... 130
Stickle Steam Specialties Co. 124
Sturtevant Co., B. F..... 119
Supreme Heater & Ventilating Corp. 120

T

Thatcher Co. 31
Thrush & Co., H. A..... 10
Titusville Iron Works Co... —
Trane Co. 44

U

Union Fibre Co. 144
United States Ozone Co.... 128
Universal Smokeless Boiler Co. 8
Utica Heater Co. 11

W

Want Ads. 114
Webster & Co., Warren.... 41
Weil-McLean Co. 151
Wheeler Condenser & Engineering Co. 140
Whitlock Coil Pipe Co..... 14
Wing Mfg. Co., L. J..... 118
Wolff Coal Saver Co..... 7
Wolff Gas Radiator Co., A. H. 25
Wright-Austin Co. 112
Wyckoff & Son Co., A..... 144

Y

Yeomans Bros. Co..... 140
York Heating & Ventilating Corp. 124
Young Pump Co. 149

Save Coal—Prevent Condensation

INSULATE ALL ROOFS

ABOVE—DELTA STAR ELECTRIC CO.
Chicago, Ill. Insulated with 1" Lith.
Arch. & Eng.—Frank D. Chase, Chicago

Save Radiation Surface

ALWAYS USE INTERNAL CONDUCTIVITIES, not air to air conductivities when figuring proper thickness for roof insulation. ASK US WHY?

Union Fibre Co., Inc.

Engineers and Manufacturers

WINONA, MINN.

SALES OFFICES:

Albany, N. Y. Alexandria, La. Amarillo, Tex. Atlanta, Ga. Baltimore, Md. Birmingham, Ala. Boston, Mass.
Buffalo, N. Y. Casper, Wyo. Charlotte, N. C. Chicago, Ill. Cleveland, O. Dallas, Tex. Dayton, O.
Denver, Colo. Detroit, Mich. El Paso, Tex. Evansville, Ind. Houston, Tex. Indianapolis, Ind. Jackson, Miss.
Kansas City, Mo. Little Rock, Ark. Louisville, Ky. Los Angeles, Cal. Memphis, Tenn. Milwaukee, Wis. Minneapolis, Minn. Muskogee, Okla.
Nashville, Tenn. New York, N. Y. Norfolk, Va. Oklahoma City, Okla. Omaha, Neb. Philadelphia, Pa. Pittsburgh, Pa. Richmond, Va.
Roanoke, Va. Rochester, N. Y. St. Louis, Mo. Salt Lake, Utah San Antonio, Tex. San Francisco, Cal. Seattle, Wash. South Bend, Ind.
Spokane, Wash. Tacoma, Wash. Toledo, O. Toronto, Can. Tulsa, Okla. Waco, Tex. West Orange, N. J. Wichita, Kans.

No. 6—23 W
Water Boiler

Gurney New

400 Series Boilers

Another distinctive series of the Gurney Line of Boilers is the "New 400 Series" of steam and water boilers.

This series has been improved steadily and now represents all that could be desired of a modern boiler designed especially for heating residences and buildings of moderate size. Refinement, durability, simplicity, ease of operation and economy in fuel consumption have been brought to highest perfection. The purchaser is assured best heating efficiency with minimum amount of fuel and care.

Some leading features are: Highly efficient triangular grates, positive and rapid circulation of water in close contact with fire and heated gases at every available point; large and roomy ash pit and base; improved taper push nipple connections, and accessibility of all fire and flue surfaces for cleaning.

Send for Catalog

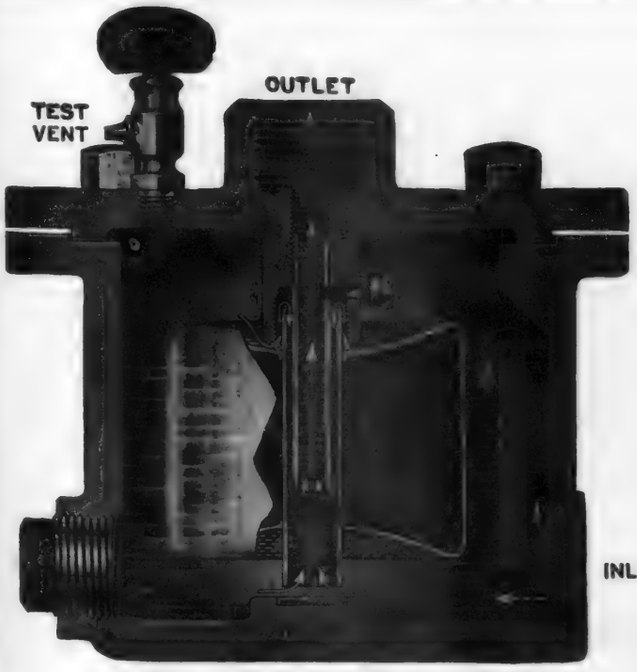
GURNEY HEATER M'F'G COMPANY.

GENERAL OFFICES:

New York
Long Isand City
Manly St., Cor. Anable Ave.

Boston, Mass.
93-95 Oliver St., Fort Hill Square

Philadelphia
108 North 17th Street



MARSH

DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

We Invite Correspondence

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

FOUNDED 1865

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents Indicating and Recording Gauges

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario

Fuel-Economy-

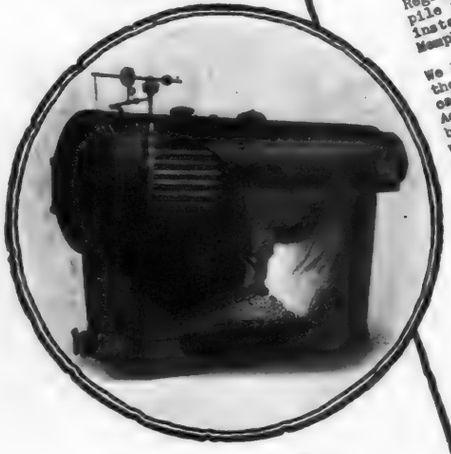
An Outstanding Feature

USERS are always telling us of their complete satisfaction with Pacific Boilers. The reason for this is that we are not selling theory; we are selling heating economy based on facts. Therefore, we are not making any claims for Pacific Boilers other than those proved by actual performance on the job.

Read the reproduced letter which proves the greater fuel economy of Pacific Boilers. Then, write us for details explaining why these boilers give such remarkable results.

GENERAL BOILERS COMPANY, *Waukegan, Illinois*
Branch Offices in Principal Cities.

Lowenstein's Dept. Store, Memphis, Tennessee: Architects—Hanker & Cairns—Emile Weil; Engineer—Thomas H. Allen; Heating Contractor—Hughes Heating Company. Two No. 632 Pacific Smokeless Boilers.



Pacific Smokeless Boiler

Lowenstein's
SINCE 1888
MEMPHIS

July 3, 1925.

General Boilers Company,
Memphis, Tennessee.

ATTENTION: Mr. C.L. Ahler.

Gentlemen:

Regarding information and data you have requested us to compile regarding the operation of Pacific Steel Heating Boilers installed in our new building by the Hughes Heating Company, Memphis, we are pleased to give you the following.:

We have 24,200 sq.ft. of direct cast iron radiation. We have the equivalent of a little more than 15,000 sq.ft. of direct cast iron radiation installed and known as the American Blower Aerofin Radiation. In our warehouse which is a separate building, we have 6,000 sq. ft. of direct cast ir on radiation which is heated from the same plant. This makes a total of an approximate load of 45,200 sq. ft. of direct cast iron radiation.

We have two of your 30,000 sq. ft. Pacific Boilers installed and at no time during the past winter was it necessary to operate but one of the boilers at a time, even in zero weather.

In regard to coal consumption, cost and etc. we beg to submit the following; Cost of coal per ton $4.25 delivered and during the month of Oct. we used 18 tons; Nov. 49 tons; Dec. 139; Jan. 123½ tons; Feb. 70 tons; March 26½ tons, making a total of 408 tons for the heating season, cost of same being $1,819.28.

Our engineer has had many years experience and he states that these boilers operate as easily and give better results than any boiler he has had experience with before.

Yours very truly,
President.

HTB'LT

PACIFIC

STEEL HEATING BOILERS

STEEL HEATING BOILERS
PACIFIC
WAUKEGAN ILLINOIS
TRADE MARK REG. U.S. PAT. OFF.

Why are KEWANEE FIREBOX BOILERS selected for heating finer buildings?

Fourth

BECAUSE the fundamentals of design are correctly related

And

the combustion chamber and flues, the heating surface, water content, disengaging area and steam space are proportional to the boiler capacity.

Rich Memorial High School
Clifford Slaughter & Co., Architects
H. G. Newman Plbg. Co., Heating Contractors
Two No. 320 Kewanee Smokeless Firebox Boilers

KEWANEE BOILER COMPANY

KEWANEE, ILLINOIS

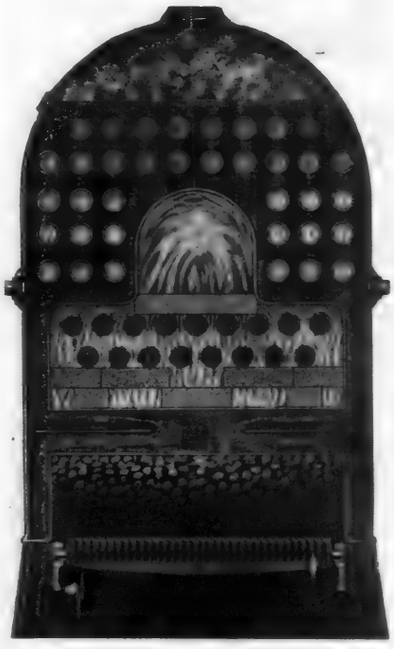
Atlanta
Birmingham
Boston
Charlotte, N C
Chattanooga
Chicago
Cincinnati
Cleveland
Columbus
Dallas
Denver
Des Moines
Detroit
El Paso
Grand Rapids
Indianapolis
Kansas City
Los Angeles
Memphis
Milwaukee
Minneapolis
New York City
Philadelphia
Pittsburgh
St Louis
Salt Lake City
San Antonio
San Francisco
Seattle
Spokane
Toledo

Dominion Kewanee Boiler Company, Ltd., Toronto, Ont

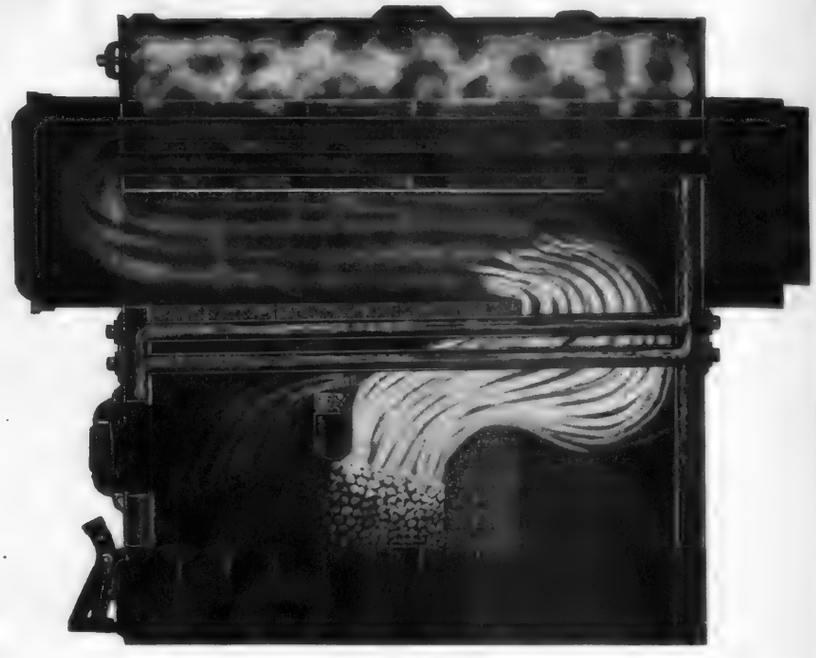
ROSS STEEL BOILERS

DURABLE — SMOKELESS — FUEL SAVERS

To Heat Any Size or Type of Building



Front View



Side View

INSIDE STUFF THAT COUNTS

HIGH OPERATING EFFICIENCY due to large crown sheet, water tube and firebox surfaces exposed to radiant heat. Central return flue to complete combustion. Fire tubes for gas travel. Heating surface, grate surface and draft areas scientifically proportioned. Efficient smokeless arch. Large water content perfectly circulated. Ample disengaging area and steam space. Steady water line.

LONG-LIVED because the best quality material is used, and workmanship is carefully applied and inspected. Built of steel plate with all seams and staybolts electrically welded. Full length self-cleaning crown sheet. Indestructible smokeless arch. All handholes and washout plugs on the outside of boiler and not exposed to flames or hot gases. Easily accessible for cleaning. Parts simple and standard.

The Frost Manufacturing Co.

Established 1851

Main Office and Works Galesburg, Ill.
Chicago Sales Office 112 West Adams St.

Fuel Conservation is largely a matter of proper draft regulation

The finest boiler built can't perform with its greatest efficiency unless it is properly operated. And proper operation is largely a matter of proper draft regulation. Too much air, or too little air runs the *efficiency down* and the *coal bill up.*

Wolff Draft Conditioners

Save fuel and better heating conditions by "conditioning" the draft to the boiler

Among some 5500 *Chicago buildings, whose boilers are equipped with Wolff Draft Conditioners are practically all the stations and garages of the Yellow Cab.*

This alone is proof that Wolff Draft Conditioners do everything we say they will.

Wolff Draft Conditioners govern the amount of air which gets into the firebox—regulating it according to what is needed. Also: they regulate the speed of the gases passing through the boiler, and *hold them until the water has a chance to absorb the heat.*

They take care of the "variable load" which every heating plant is up against. By merely changing the hooks on the Regulator Plate (a patented Wolff device and a part of every Wolff Draft Conditioner) the draft is automatically "conditioned" according to the amount of heat needed.

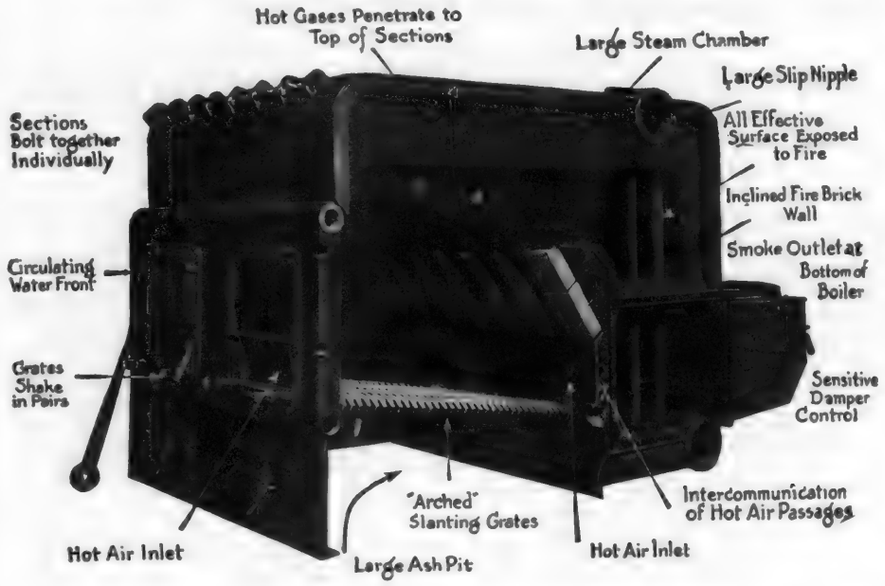
They almost eliminate the "human element" from the proper handling of the boiler.

Ask us for proof. Every Heating Contractor can make money selling and installing them

Wolff Coal Saver Company

1336 West Congress St., Chicago

Ask Us Why Your Customers Will Buy


Hot Gases Penetrate to Top of Sections
Large Steam Chamber
Large Slip Nipple
All Effective Surface Exposed to Fire
Inclined Fire Brick Wall
Smoke Outlet at Bottom of Boiler
Sensitive Damper Control
Intercommunication of Hot Air Passages
Hot Air Inlet
"Arched" Slanting Grates
Large Ash Pit
Hot Air Inlet
Sections Bolt together Individually
Circulating Water Front
Grates Shake in Pairs

1st—For carefree, solid comfort through the severest weather.

2nd—For economy in fuel expense. Through correct application of complete combustion practically all of the fuel used, whatever its nature, goes into useful steam.

3rd—For inexpensive installation. Convenient for basements with low ceilings because of its low water line feature which also allows the use of small mains thereby cutting costs.

Catalog 23 gives many more answers. Send for it.

NIAGARA RADIATOR & BOILER COMPANY

General Office and Factory—North Tonawanda, N. Y. Branch Office and Factory—Chicago, Ill.

NIAGARA LOW WATER LINE SMOKELESS BOILERS

Push Nipples on the Outside

More Corrugations on the Inside

BY placing the push nipples on the outside of the boiler, instead of the inside,—there is space for more corrugations—consequently more heating surface. The number of corrugations depends on the size of the boiler, of course. But whatever the size of the boiler, Burnham straight-line design at the sides of the fire chamber provides the widest heating space above the fire pot, and the largest number of corrugations.

The Burnham Boiler Catalog shows this and other advantages in detail. Send for it.

Representatives in all Principal Cities

Burnham Boiler Corporation

Irvington, New York

Canadian Offices,
Harbor Comm. Bldg., Toronto
124 Stanley St., Montreal

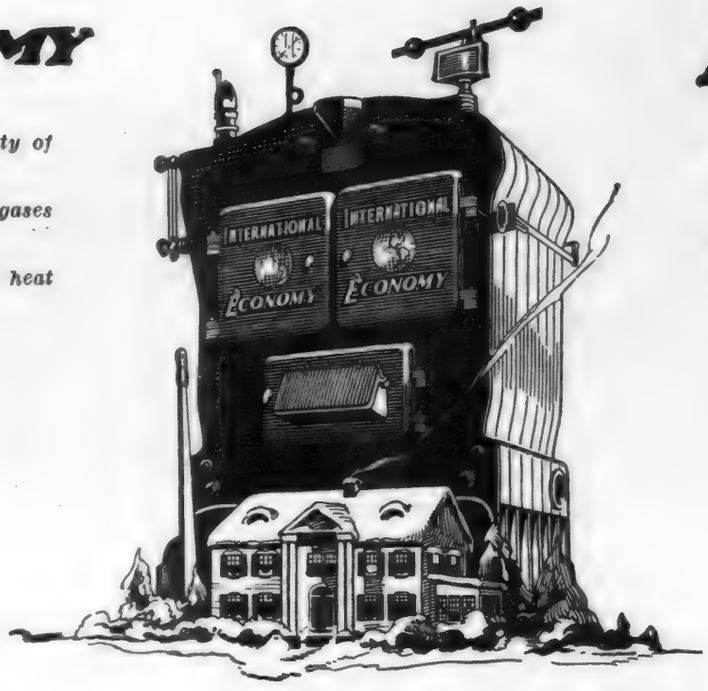
INTERNATIONAL

ECONOMY BOILERS

Large firepot holds plenty of fuel.

Positive circulation of gases and water.

Maximum generation of heat contained in fuel.



Heat absorbing surfaces designed for most effective use of heat.

Steam dome and positive circulation of water arranged to deliver dry steam without a header.

"I've never seen a boiler that could beat an ECONOMY for quick steaming."

This is an exact quotation from a statement of one of our enthusiastic users.

The main reason for Economy success is its correct design as a unit.

Just one specific feature is its ability to deliver dry steam without a header.

INTERNATIONAL HEATER COMPANY

UTICA, NEW YORK

Branches and Warehouses at:

NEW YORK CHICAGO CLEVELAND DETROIT NASHUA, N. H.

If you want the Most Efficient *and* Economical Heating——

I Always Recommend

HOT-WATER *with* THRUSH Automatic Regulation

The Heating Contractor and Health

THRUSH HOT WATER HEATING SYSTEM

H. A. THRUSH & CO., *Peru, Indiana.*

Let this POSTER *boost your sales!*

HERE is a beautiful poster in colors that will not only bring you more business but will build prestige for you in your community if you hang it in your window.

Thrush System of Hot Water Heating provides automatic regulation and increases the heating efficiency of any hot water job. It can be installed on any boiler, old or new, and is quite inexpensive. Send for Thrush catalog and literature and get acquainted with this profitable, quick selling line of hot water heating specialties.

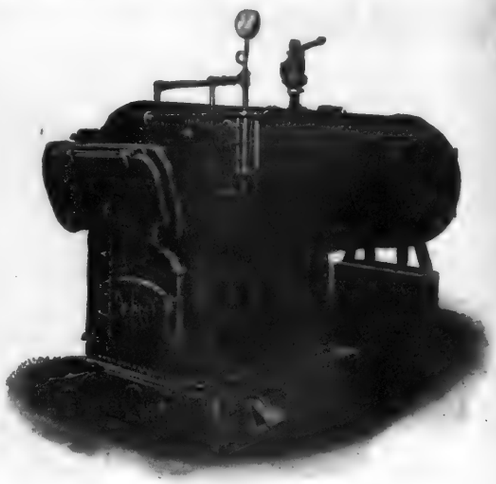
Ask about our Special Offer, Too!

Thrush System of HOT WATER HEATING

H. A. Thrush & Co.

PERU, INDIANA.

AMES Firebox Heating Boilers



Ames Firebox Heating Boiler with Plain Furnace

Built with Plain and Downdraft Furnaces. Incorporating the Latest and Most Advanced Ideas in Boiler Design and Construction.

We also build a complete line of Horizontal Tubular, Upright and Empire Boilers for Heating and Power Requirements.

Bulletins with complete details mailed on request.

Empire Return Tubular Portable Boiler

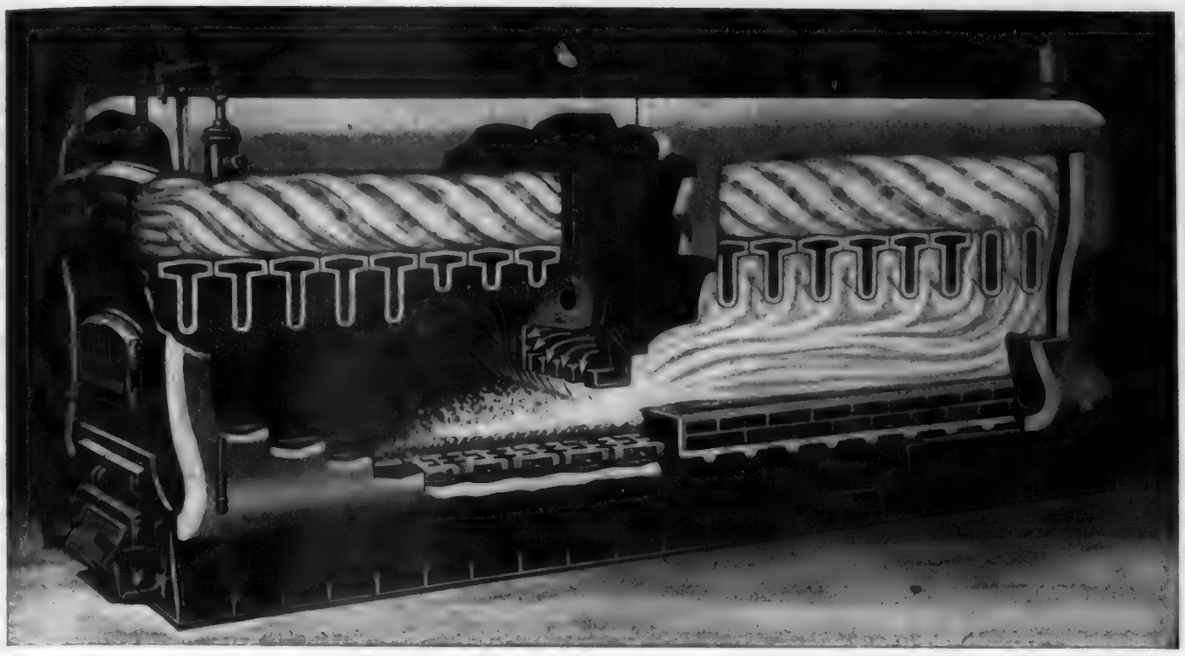
AMES IRON WORKS

DIVISION OF

Pierce, Butler & Pierce Mfg. Corp.

Main Office & Works Oswego, N. Y.

General Sales Office 41 E. 42nd St., New York City



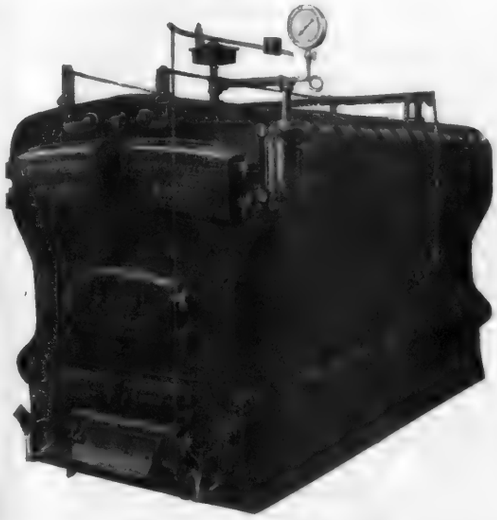
Cutaway View of Boiler, Black Background

UTICA-IMPERIAL

SUPER-SMOKELESS BOILERS

Require Minimum Care and Attention!

A recent improvement put the Air Regulation under easy control from the front of the boiler.



Exterior View of Boiler

Utica Imperial SUPER-SMOKELESS Boilers require little care and attention. They are easy to operate and do not need a skilled engineer to care for them. They are as near fool-proof as it is possible for a heating boiler to be. Utica Imperial SUPER-SMOKELESS Boilers utilize all of the fuel to obtain smokeless combustion, and the flues are scoured clean by the rotative velocity of the gases travelling through them at a high temperature. And the fuel is burned so completely that there remains a comparatively small amount of ashes or clinkers to be removed. All of these things mean less work for the fireman, and, in addition, unusually long firing periods are obtained. Engineers and Contractors are invited to write for complete information.

Manufactured by the

UTICA HEATER COMPANY

UTICA, NEW YORK

CHICAGO CLEVELAND NEW YORK

Sales Offices in the Principal Jobbing Centers

(Patented)

The sides of the ash pit are water cooled.

UNIVERSAL

SECTIONAL CAST IRON WATER TUBE BOILERS

For Steam, Hot Water, Vapor Vacuum Heating Systems

36″ and 24″ Series Single Grate
Up-Draft 100% Water Tube

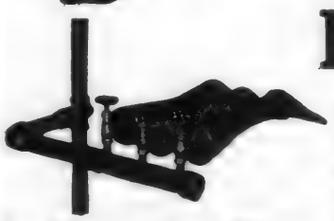
Low Water Line Boilers

24″ Series—Water line 47 inches
36″ Series—Water line 48 inches

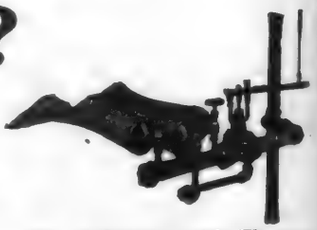
UNIVERSAL SMOKELESS BOILER COMPANY

RAVENNA, OHIO

Do You Know the Economy of Burning Gas the Franklin Way?



No. 3 System without Thermo Valve and By-Pass



No. 3 System with Thermo Valve and By-Pass

The idea of burning gas for heating is now being considered by every home owner, as the economical FRANKLIN BURNER can be installed for the small sum of about $35.00, which price is within the reach of everybody.

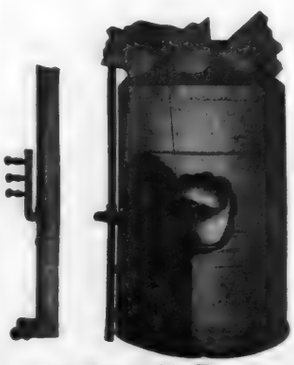
The Franklin New Improved Quick Removable Gas Burner eliminates the necessity of installing an expensive separate gas furnace, for their present hot water, steam boiler or hot air furnace can be converted into a combination gas and coal heating apparatus immediately.

Gas with the Franklin is quick, clean, convenient, safe and positively economical. Burners can be removed or reinstalled in one minute without tools. Ideal for Fall and Spring heating.

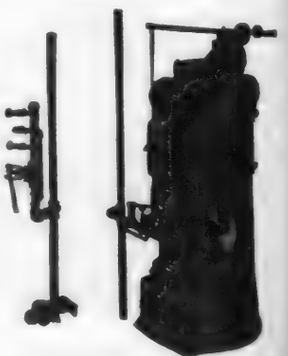
$10.00 to $15.00 profit on every installation.

We will furnish a complete No. 3 Unit System for $18 and will furnish a complete window display with same so you can show your customers what the burner will do.

Act now before the first cold spell. Write for Catalog.



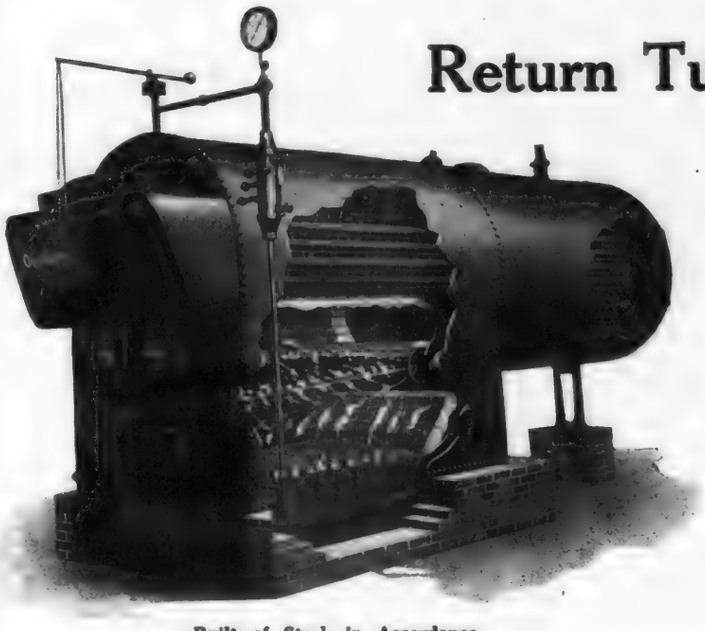
For Warm Air Furnace



For Steam or Water

FRANKLIN GAS BURNER MFG. CO.
VINE AND MITCHELL AVE. CINCINNATI, O.

Fuel Economy *with* Oil City Smokeless Boilers



Built of Steel, in Accordance with the A. S. M. E. Code.

Return Tubular Portable Fire-box for Heating

Burn Any Kind of Fuel

Oil City Smokeless Boilers are adaptable to:

APARTMENTS
CHURCHES
CLUB HOUSES
COURT HOUSES
HOSPITALS
GARAGES
HOTELS
OFFICE BUILDINGS
LARGE RESIDENCES
POST OFFICES
SCHOOLS, ETC.

Let us send Catalog H-9

ECONOMY in Oil City Boilers is not confined entirely to their performance and low maintenance cost. Another factor of economy is in their adaptability to the use of any kind of fuel, with perfect safety and the assurance of securing the maximum amount of heat therefrom. Large fire boxes insure ample combustion space in which the heat-giving gases and the air mix freely.

Oil City Boilers, being built of steel, reduce insurance risk and assure great strength and longevity. In one unit, they comprise all the elements of a modern plant for steam or hot water heating. Self-contained—all in one—ready to set up and operate.

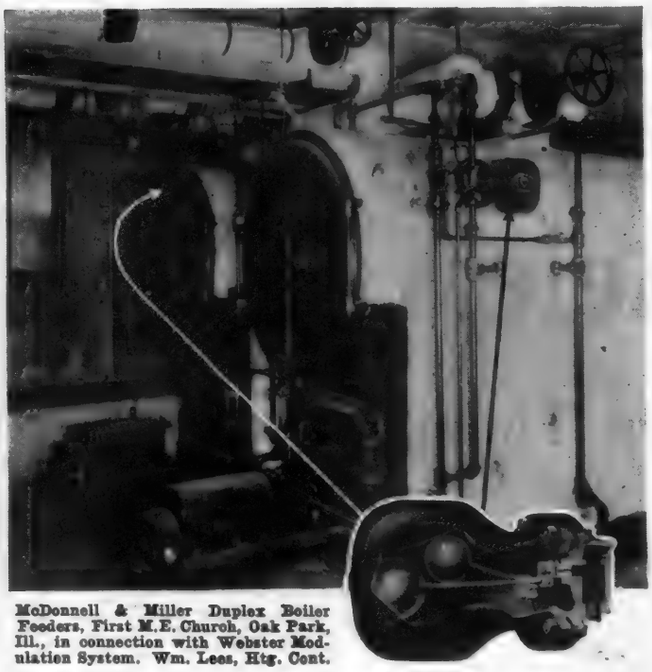
Built on over 45 years of sound, practical experience in the manufacture of high grade boilers.

OIL CITY BOILER WORKS

OIL CITY, PENNA.

BRANCH OFFICES

ATLANTA
BALTIMORE
BUFFALO
CHICAGO
CINCINNATI
DENVER
DETROIT
INDIANAPOLIS
LOS ANGELES
NEW YORK
PHILADELPHIA
PITTSBURGH



McDonnell & Miller Duplex Boiler Feeders, First M.E. Church, Oak Park, Ill., in connection with Webster Modulation System. Wm. Lees, Htg. Cont.

FOR SAFETY'S SAKE

—you need a McDonnell and Miller Duplex Boiler Feeder on every oil fire steam heating job!

Low Water Alarms and other similar devices are like a fire alarm—they give notice that something is wrong—**but they don't correct the trouble.**

The McDonnell and Miller Duplex Boiler Feeder is better protection than all other safety accessories because it **prevents** trouble rather than remedying it.

It **prevents** low water and its expensive results—burned boilers and cracked sections;

It **prevents** low water and its expen- fuel;

It **eliminates** manual control by providing absolute mechanical control of the water-line;

It has never failed!

Write for Bulletin H-3. It explains the advantages to you and to your customer.

McDonnell & Miller

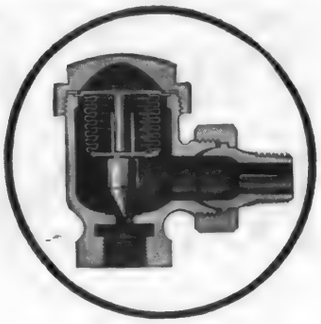
"Doing One Thing Well"

The Only Exclusive Manufacturers of Water Feeders

General Offices
Wrigley Bldg.
CHICAGO

M&M WATER FEEDER

Eastern Warehouse Stock
Bush Terminal
NEW YORK



Look at These Prominent Installations

Here are just a few of the buildings, scattered from coast to coast, in which Sarco Radiator Traps have been installed. We can refer to hundreds of others.

Allerton Hotel, New York
Majestic Hotel, New York
Times Square Hotel, New York
Hotel Royal Bermudiana, Hamilton, Bermuda
Bermuda Club, Bermuda
Hotel Nassau, Long Beach, L. I.
Ford Manor Apartment, Detroit, Mich.
Police Precinct Bldg., Detroit, Mich.
Jamestown Hotel, Jamestown, N. Y.
New York Pie Baking Co., Newark, N. Y.
Ford Assembly Plant, Arabi, La.
Rollman & Sons, Cincinnati, Ohio
Continental Can Co., Jersey City, N. J.
Robert Griffin Co., Jersey City, N. J.
Passaic Worsted Spinning Co., Passaic, N. J.
American Snuff Co., Clarksville, Tenn.
Vacuum Oil Co., Paulsboro, N. J.
Chicago Tribune Buiding, Chicago, Ill.
Knights of Columbus Bldg., Haverstraw, N. Y.
Tremont School, Cleveland, Ohio
Addison School, Cleveland, Ohio
University of Virginia Gym, Charlottesville, Va.
Farnum School, Royal Oak, Mich.
Central Village High School, Central Village, Conn.
Moses Taylor Hospital, Scranton, Pa.
Mercy Hospital, Cedar Rapids, Ia.
Strand Theatre, Schenectady, N. Y.
Matson Bldg., San Francisco, Cal.

If you want to be sure, beyond any question of doubt, of specifying radiator traps on which there will be no comeback, no kicks, you can't go wrong on the Sarco.

Our booklet P-126 explains why. Write for a copy.

SARCO COMPANY, Inc.

231 Broadway, New York City

Buffalo Chicago Cleveland
Boston Detroit Philadelphia

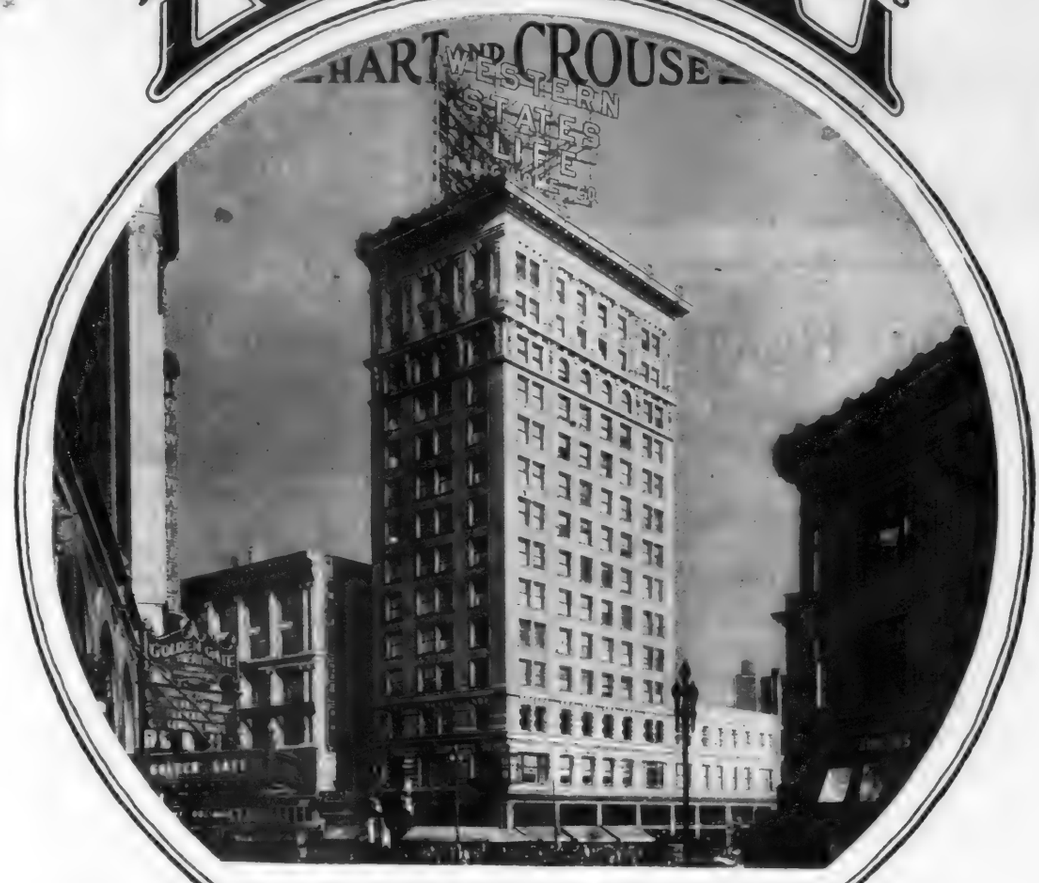
Peacock Bros., Ltd., Montreal

SARCO

Radiator Traps

ROYAL

ROUND SECTIONAL and SMOKELESS BOILERS



WESTERN STATES LIFE INSURANCE CO.

REID BROTHERS, Architect — CHARLES T. PHILLIPS, Consulting Engineer
PERRY WOOD, INC., Heating Contractor

THE splendid reputation of ROYAL Boilers for durability undoubtedly influenced the Western States Life Insurance Co. to install a ROYAL S-604 to replace antiquated equipment in their home office at San Francisco.

This ROYAL S-604 operating successfully with oil, is typical of many other ROYALS serving prominent buildings throughout California.

The Great Western Supply Co. of San Francisco and Los Angeles are sole distributors for ROYAL Boilers in the State of California.

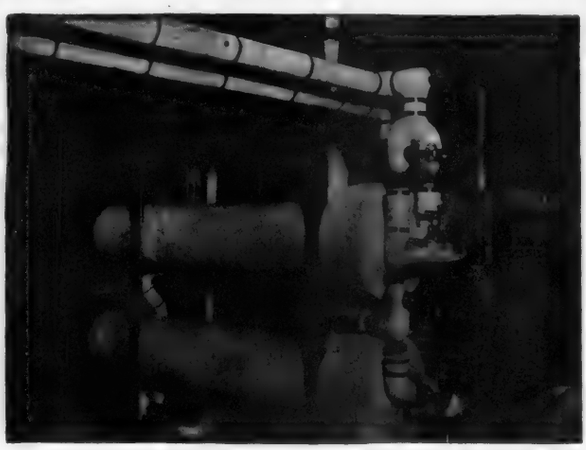
Cosy Cottage
or
Soaring Skyscraper

HART & CROUSE COMPANY
UTICA, N. Y.

BRANCH OFFICES

*Boston	*Detroit	*Philadelphia
*Chicago	Grand Rapids	Pittsburgh
Cincinnati	Milwaukee	*St. Louis
Cleveland	*New York	*Utica

*Warehouse in connection



Two Whitlock Type R Oil Heaters

FUEL OIL HEATERS

If the building is to be equipped to burn fuel oil the question of the proper fuel oil heater to install is a vital one.

Whitlock Engineers have learned by years of experience that different types of heaters are required for different operating conditions.

As we manufacture several types, and all sizes, you can be sure that our recommendations for your particular problem will be absolutely unbiased.

You will avoid delay if you are careful to give us all of the information requested in the coupon below.

I am interested in an oil heater which will heat..... pounds per hour of ..... degree Baume fuel oil, from ..... degrees F. to ..... degrees F. when supplied with sufficient steam at ..... pounds gauge pressure.

Name .....

Address .....

Firm .....

Clip Coupon and Mail to

THE WHITLOCK COIL PIPE CO.
40 South Street, Hartford, Conn.
New York Chicago Boston Buffalo Philadelphia
San Francisco

WHITLOCK
HEAT TRANSFER
PRODUCTS

Combination heating for offices

Gasteam Radiators in Office of a Chicago Brick Company

WITH combination heating systems, steam heat for any office or any group of offices is always available. Even when the central heating plant is closed down.

When the central heating plant is operating the Clow Gasteam Radiators function as any other radiator. When the central heating plant is closed down the Gasteam Radiators produce their own steam.

Plant offices especially appreciate them, as it is frequently necessary to heat the offices when heat is not required in the plant. Such an installation is shown above.

Similarly the Gasteam Radiators supply steam heat quickly and economically, at times when the boiler is shut down, such as nights, holidays, and in the fall and spring.

Combination heating permits of starting the boiler a month or two later in the fall and shutting it down a month or two earlier in the spring.

The cost of the installation is negligible in comparison with the savings and convenience.

JAMES B. CLOW & SONS
534-546 S. Franklin St., Chicago
Sales Offices in Principal Cities

{Each Radiator an Independent Steam Heating Plant}

CLOW
GASTEAM — GASWATER

PAGE BOILERS

"The Distinguished Service Line"

No. 23 C Volunteer Steam Boiler

No. S-409 Monarch Steam Boiler

PAGE Boilers are a good investment—from the viewpoint of the engineer and contractor because they "do the job well," producing dry steam or circulating hot water when needed and for as long a heating period as needed, without forcing—from the viewpoint of the owner because they are easy on the coal pile and outlast the building in which they are installed.

The Volunteer round boiler will take care of your small house heating problems. The ashpit allows ample depth for accumulation of ashes—the triangular revolving grate bars, each bar a shaker bar and interchangeable, are easily operated and superior to any other style of grate. The firepot is a single section, with crownsheet cast integral with the walls of the section, forming the most effective and valuable heating surface, directly over the fire. The sections and dome are arranged to absorb from the gases the greatest possible percentage of heat units—and the liberal steam space in the dome insures dry steam and provides an ample reserve.

The Monarch square boiler, for larger work, is an assemblage of heavily cast sections, designed to provide a firebox of ample size and depth to insure results, in which is fitted a cradle supported grate, resting on rollers, which cradle may be entirely withdrawn from the boiler if the grate requires attention. The liberal areas of heating surface above the grate is designed to produce an abundance of dry steam or to quickly circulate hot water. A feature of this heating surface is the long three-way fire travel, three times back and forth, each time on a different level, passing the gases of combustion through long heat-absorbing corridors, until the heat units have been utilized to the greatest possible degree.

Specify the Volunteer and Monarch and assure your clients of heating satisfaction, the result of the care and the more than half century's manufacturing experience that goes into the design and production of Page Boilers.

For All Fuels—
Hard Coal,
Soft Coal,
Gas or Oil.

Send for Catalogue 51. It gives you in concise form, complete specification data.

THE WM. H.
PAGE BOILER CO.

58 West 40th Street
NEW YORK

BOSTON
PHILADELPHIA
CLEVELAND
MEADVILLE

Established 1856 Incorporated 1877

Instant Hot Water

DAHLQUIST AQUATHERM COPPER RANGE BOILER

A Device That Has Long Been Needed

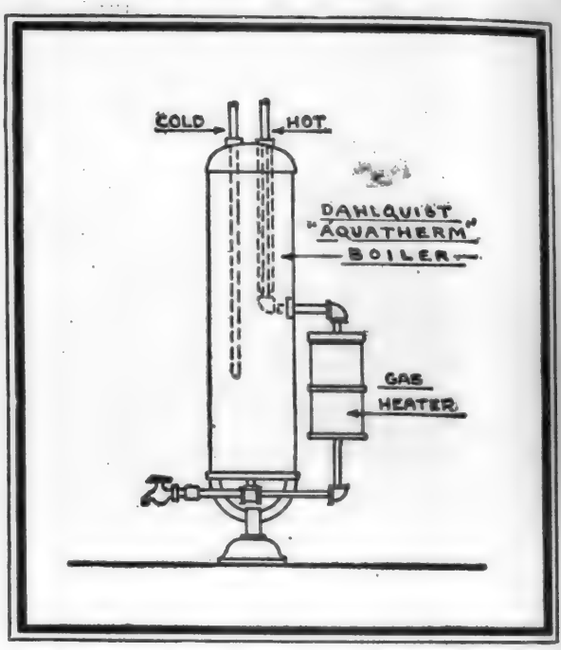
One of the most important developments in range boiler construction in many years is the DAHLQUIST AQUATHERM COPPER RANGE BOILER, which furnished to the consumer instant hot water at a minimum cost. It can be furnished in any size desired.

And the DAHLQUIST AQUATHERM can be furnished separately in proper size for any range boiler now installed.

Can be installed with any ordinary gas tank heater, water back in coal range, indirect heater, or coil in boiler or furnace, or electric heater.

Let us send full details.

DAHLQUIST MFG. CO.
40 W. 3rd St. BOSTON, MASS.



Dahlquist Aquatherm Copper Range Boiler installed in connection with gas tank water heater in kitchen (note the simplicity and neat appearance of installation).

Sterlco
TRADE MARK

The Sterlco-Roys Thermotrol

TYPE B

The new model Type B Thermotrol controls room temperatures accurately.

Can be used at top or bottom of radiator.

Valve has universal connection for top, bottom, left or right connection.

No wall thermostats, air compressors or piping necessary.

Regulation secured through thermostatic action.

Write for Bulletin No. 38.

STERLING ENGINEERING COMPANY

1626-40 Holton Street, MILWAUKEE, WIS.

REPRESENTATIVES IN ALL LARGE CITIES

Continental

BOILERS & RADIATORS

St. Joseph's Home for Children
Erie, Pennsylvania
Heating Contractor, Gannon & Carey
Boilers: Two No. 4029 Continental Low Water Line Boilers (34,000 sq. ft. boiler capacity)

Better Heating in Erie, Pennsylvania, with Continental Low Water Line Boilers

QUICK pick-up, easy firing and, above all, fuel economy, were three of the reasons why Continental Low Water Line Boilers were specified for the St. Joseph's Home for Children in Erie, Pennsylvania.

What Continental Low Water Line Boilers are doing in Erie, they are doing the world over, and here's why:

They are quick steamers.
They are easy to fire.
They get the most out of every pound of fuel.
They burn any kind of fuel, including oil.
They eliminate refuse-gathering pits.
They are built in regular and smokeless types; for large residences, apartments, schools, churches and industrial buildings.

Unusual installation and operating economies make Continental Low Water Line Boilers easy to sell and profitable to handle. Send for the story of Continental Boilers and Radiators — it's good business to know it.

Continental Heater Corporation

Home Office and Factory

Dunkirk, N. Y., U.S.A.

You owe it to yourself to have this book. It tells the inside story of Continental Boilers and Radiators. Write for your copy now.

Built for better heating

WHAT MAKES GOOD PIPE?

THE metal should be of fine, even-grained, homogeneous steel, expertly supervised through every process of manufacture. Frequent inspection and tests should be given to insure a continuous uniform quality. The steel (Bessemer) should have a low carbon content—approximately .07 per cent—which should not vary more than .01 per cent in year's output.

The pipe should have a high tensile strength, averaging 58,000 lbs. per sq. in.; an elastic limit of approximately 36,000 lbs., either transversely or longitudinally; an elongation in 8 inches averaging 22 per cent; should be easy to thread; sufficiently ductile for making bends and coils and adapted to making various kinds of joints.

The pipe should be suitable for any type of service—water, gas, steam, air, oil—structural or mechanical; available in all sizes, weights and thicknesses—and in double lengths in certain sizes; furnished with practically any type of joint, or plain end for patent coupling or autogenous welding; should have clean, smooth interior and exterior surfaces (made by the SCALE FREE Process); available with various types of efficient coating; and be resistant to corrosive influences.

Ask for "NATIONAL" Bulletin No. 1.

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

"NATIONAL"

THE RECOGNIZED STANDARD OF WROUGHT PIPE

Why Thatcher Boiler Ratings are *Dependable*

FIRST, because they are **conservative.** They have never been advanced, never "boosted" since they were first established through a series of most exhaustive tests in competition with other makes. These tests showed conclusively that Thatcher Boilers are the most powerful house heaters for rated capacity on the market. It was also proved that a "Thatcher" transmits a greater number of thermal heat units to the water and has the longest firing periods. In every test, it was demonstrated that these splendid results were due to the scientific equalization of grate surface, flue area, and circulation of water. Secondly, Thatcher ratings are fixed so conservatively that every Boiler can easily maintain a temperature of 70 degrees in zero weather. Moreover there is ample heating capacity in reserve to provide for below-zero days.

Thatcher Boilers never have to be forced. A heater that requires forcing is not properly rated. The automatic control system on all Thatcher Boilers not only saves fuel, but keeps every room at a consistent and comfortable temperature.

It will pay you to know more about Thatcher Ratings. You will find full details in the new 80-page Thatcher Boiler Catalog, just off the press. Use the coupon and send for it today. It costs you nothing.

Act Now — Clip and Mail Coupon

THE THATCHER COMPANY,
39-41 St. Francis St.,
Newark, N. J.

Please send me your new Boiler Catalog and full information on Thatcher Ratings.

NAME .....

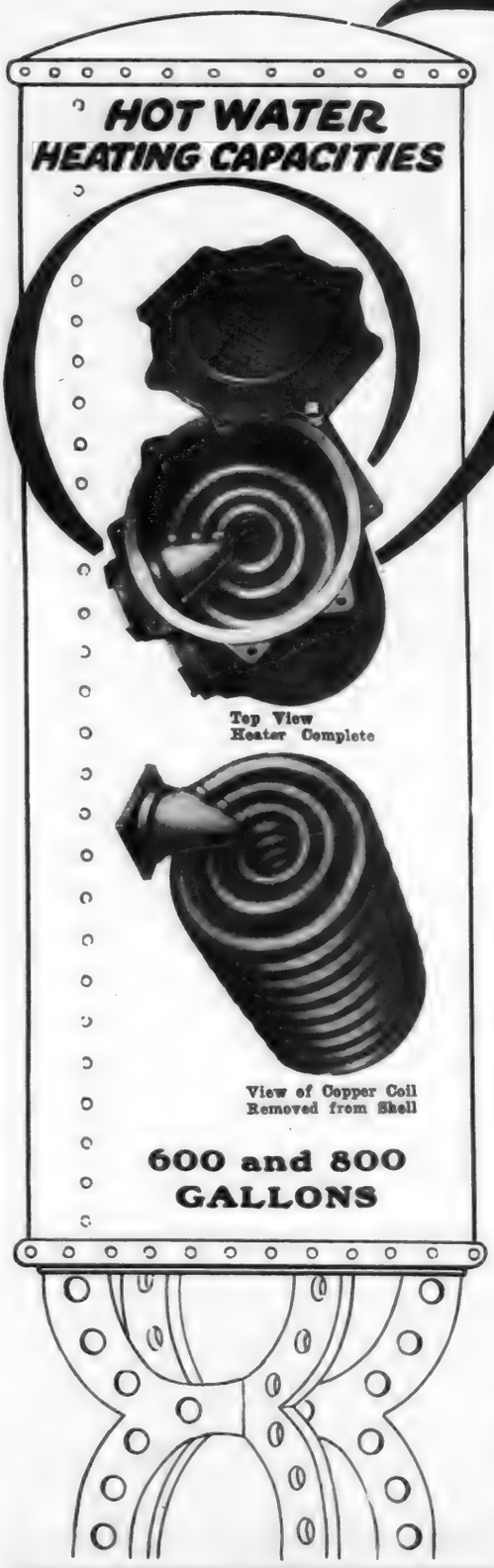
ADDRESS .....

THE THATCHER COMPANY
Formerly Thatcher Furnace Co.
39-41 St. Francis St., NEWARK, N. J.
Since 1850

NEW YORK
21 W. 44th St.

CHICAGO
341 N. Clark St.

THATCHER
BOILERS-FURNACES-RANGES



The New EXCELSO TRIPLE COIL HEATER

Now ready for shipment. Fills a growing need for a *quality* indirect heater capable of heating up to *800 gals.* of hot water when connected below water line and up to 1200 gals. when used with live steam.

As simple, as perfect, as easy to install as the smaller sizes. Connects to outside of steam or vapor heating boiler.

No. 35—600 gals. capacity
No. 36—800 gals. capacity

Batteries of triple coil heaters will supply thousands of gallons of perfectly heated water per day.

Write us for complete information and prices.

Excelso Specialty Works, Inc.
117 Clinton Street, Buffalo, N. Y.

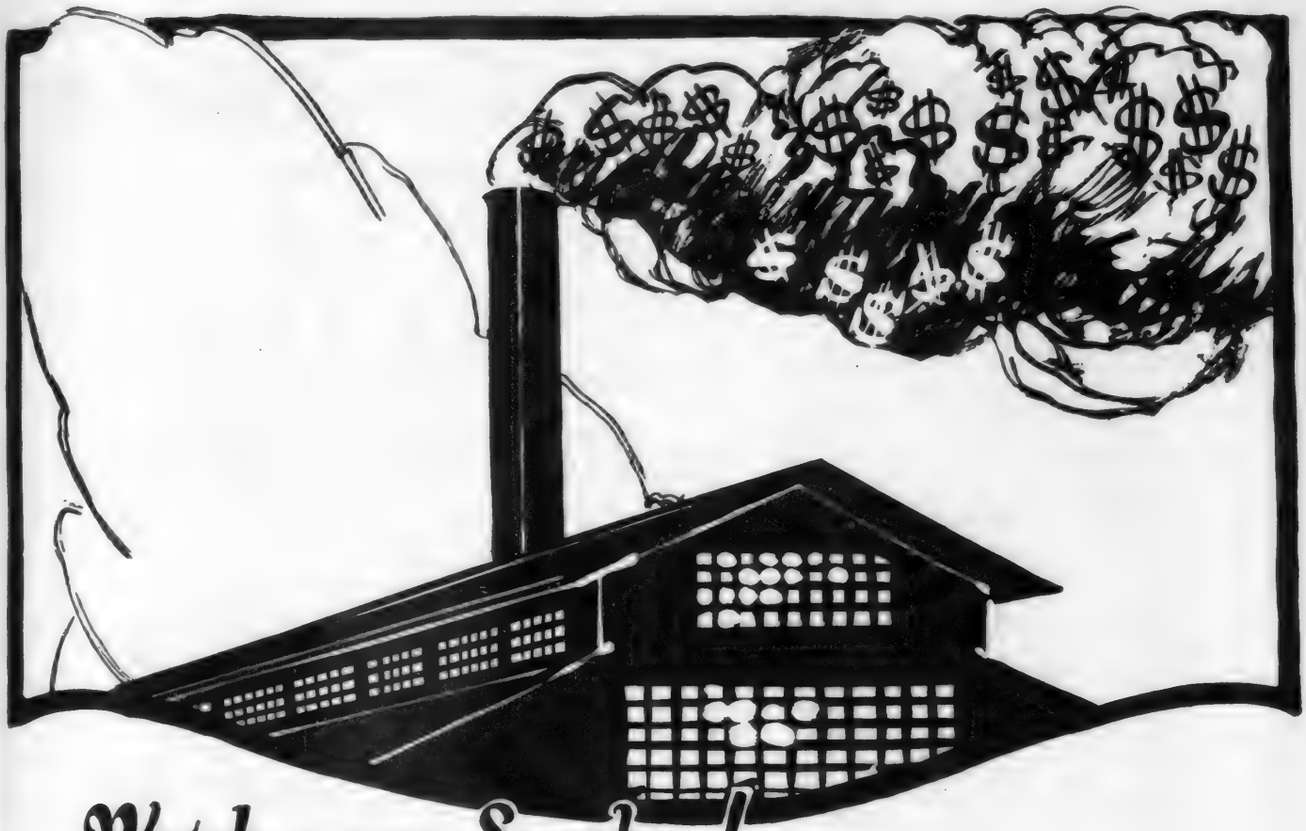
District Representatives

210 E. 45th St. New York, N. Y.
46 Cornhill Boston, Mass.
5939 Haverford Ave. Philadelphia, Pa.

NATIONALLY DISTRIBUTED BY LEADING JOBBERS AND BOILER AND RADIATOR MANUFACTURERS

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters



Watch your Smoke!

Specially constructed for bituminous coal. Will also burn anthracite without alteration.

Large firing doors. Direct and return tubes easily accessible for cleaning.

All steel construction to A.S.M.E. Code requirements.

Catalog No. 85A gives you complete details.

TICO smokeless
DOWN DRAFT RETURN TUBULAR FIRE BOX
BOILERS

The
TITUSVILLE IRON WORKS CO.

Titusville, Penna.

SALES OFFICES:

New York
152 West 42nd Street

Washington, D. C.
Woodward Bldg.

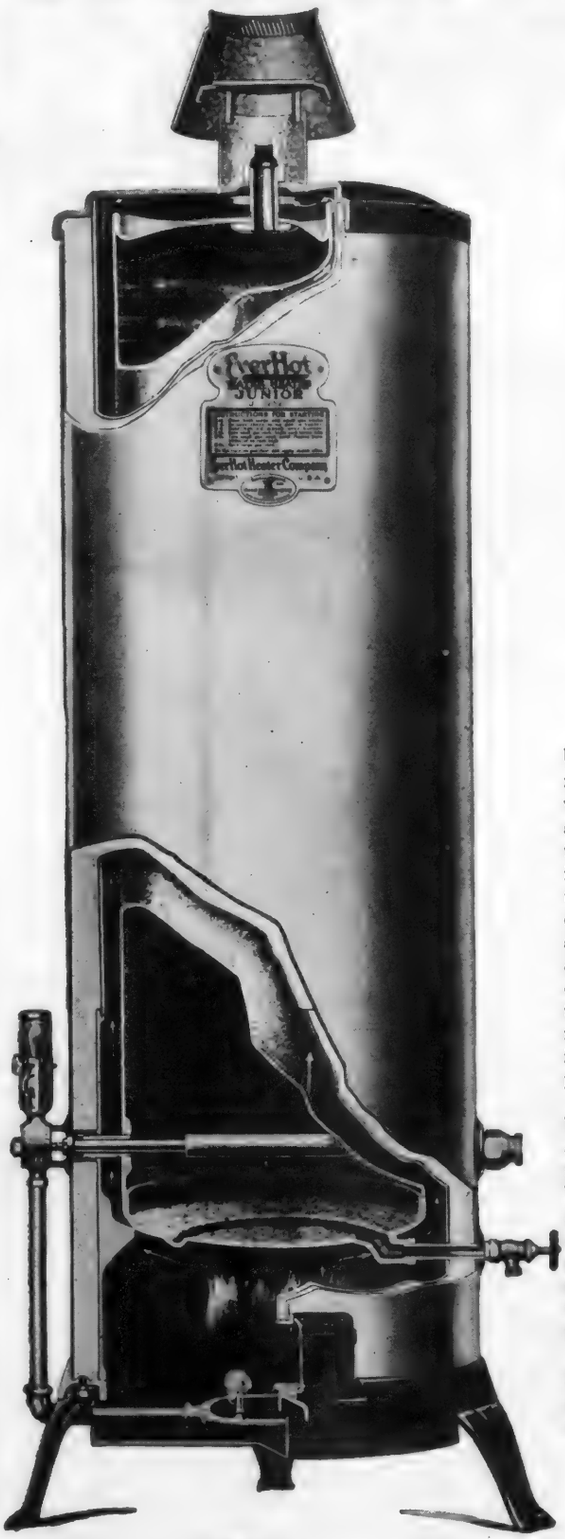
Detroit, Mich.
833 Washington Blvd. Bldg.

Buffalo, N. Y.
Marine Trust Bldg.

Pittsburgh, Pa.
Farmers Bank Bldg.

Chicago, Ill.
53 West Jackson Blvd.

Some of the Features of the EverHot AUTOMATIC WATER HEATER



1—Heating Surface.
2—Burner.
3—Thermostat.
4—Absence of Condensation.
5—Freedom from Liming.
6—Freedom from trouble

4—Absence of Condensation

Under anything like ordinary conditions we have practically no condensation with the EverHot, for three reasons: First, when the burner is down to pilot, the heating surface is necessarily hot, so of course no condensation whatever is precipitated. Second, when cold water is admitted to the boiler it is instantly diffused and mixed with the warm water at the bottom of the boiler, so that with ordinary usage there is not enough extremely cold water in the EverHot to cause condensation. Third, an ingenious but simple proportioning of excess air intakes operates to lower the dewpoint of the products of combustion to a temperature but a few degrees above that of the room in which the heater stands. This, with the features mentioned above, not only renders the heater practically free from condensation, but also prevents condensation in the vent pipe.

The advantage of this feature of the EverHot can hardly be over-emphasized. Condensation is the cause of a great portion of the troubles experienced with the instantaneous types. This will be easily appreciated when it is realized that this condensation is a dilute solution of sulphurous acid, and will attack any metal with which it comes in contact, excepting possibly lead. Other designers have attempted to dispose of the condensation after it has been formed. Our aim has been to prevent its formation and we have eliminated about 90 per cent of that troublesome feature.

Subjects 1, 2 and 3 were treated in the three preceding issues of Heating and Ventilating Magazine. Subject No. 5 will be treated in the next issue.

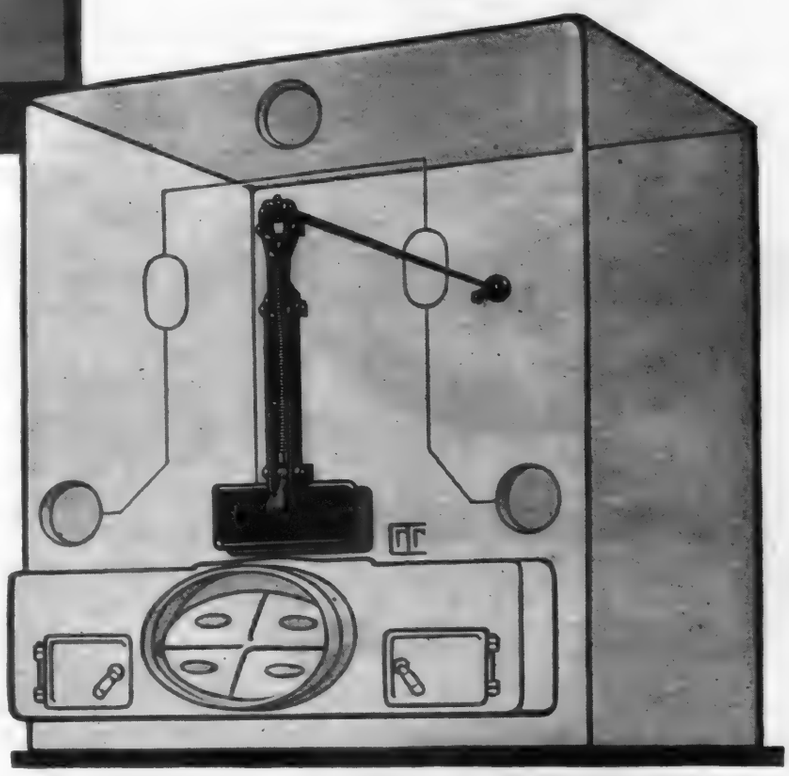
New Prices
Baby Grand $66 — Junior $88 — Senior $139

EverHot Heater Company

5211 WESSON AVENUE DETROIT, MICHIGAN
Canadian distributor, Riley Engineering & Supply Company, Ltd., Toronto, Canada.

Why is the candle dimmed?

Lower an inverted glass over a lighted candle; the flame is dimmed as the enclosed oxygen is consumed by the flame. Raise the glass and the flame brightens. You can readily control the flame by this simple process.



Only a boiler which *controls the fire* can produce EVEN HEAT

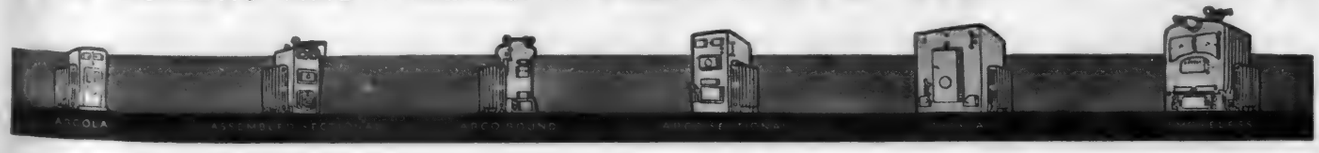
The exclusive automatic control of the IDEAL Type A Heat Machine (shown at the right) operates on this same principle. By expanding or contracting in response to the heat of the water or steam, it insures absolutely even performance. This is made possible by the airtight construction: iron to iron joints of the sections, airtight, water-surrounded ash-pit, and tight-fitting doors.

No other boilers possess this exclusive equipment. Send to the address below for the new Type A book describing this feature in detail and the many other features of IDEAL Type A.

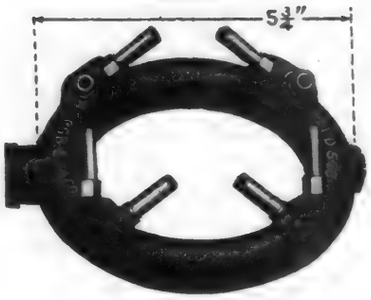
AMERICAN RADIATOR COMPANY

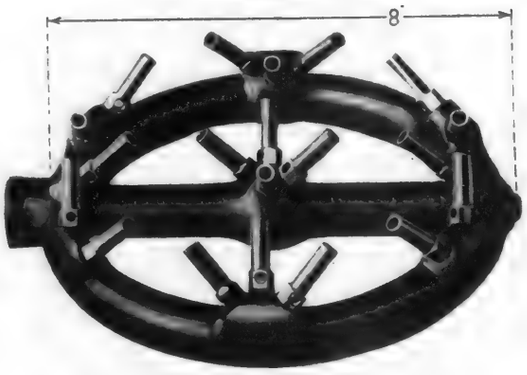
Dept. T209, 1807 Elmwood Avenue Buffalo, New York

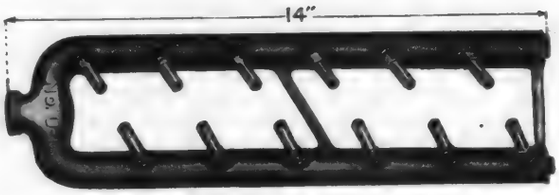
IDEAL BOILERS AND AMERICAN RADIATORS FOR EVERY HEATING NEED

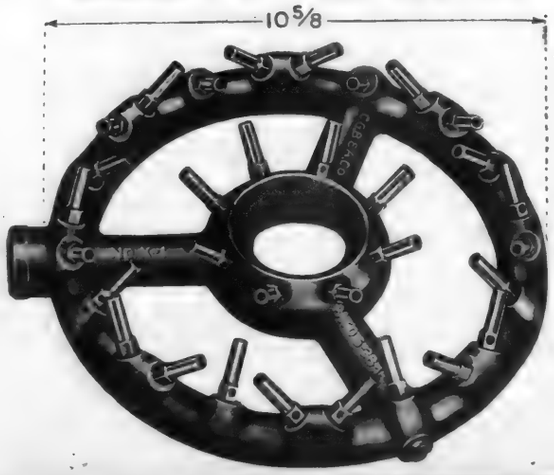


The Most Prominent Appliance Manufacturers are turning to—









BARBER Patented JET GAS BURNERS

They realize, that without the proper burner, no appliance can stand the test, and that the most perfect burner made is the Barber Patented Jet Burner.

Put the best materials into your appliance—the most scientific design — skilled workmanship and the greatest care in manufacture—yet it is all lost if the burner does not operate efficiently, for your appliance is no better than its burner.

Why not use Barber Burners in your appliances? They not only increase efficiency, but they increase sales.

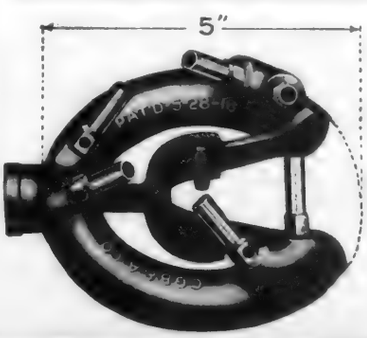
Here are the features that make Barber Burners the leaders in the field:

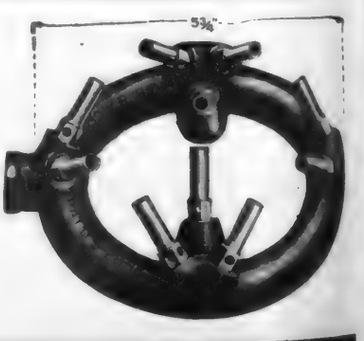
1. *Will reduce gas bills 25 to 40 per cent.*
2. *Render the pilot light unnecessary.*
3. *Can be controlled with any good thermostat.*
4. *Will not back-fire, or deposit carbon, upon any gas pressure.*
5. *Will develop a flame temperature of 1960 degrees Fahr. with 500 B.T.U. gas.*
6. *Require no adjustment, regardless of pressures or quality of gas.*
7. *Jets or orifices cannot become corroded or clogged or affected by condensation.*
8. *Will produce a perfect orange-green flame with Manufactured, Natural or Mixed gas.*
9. *Are the result of over seven years' careful development by Gas Burner Specialists.*
10. *Have been adopted as Standard by leading Heater and Gas Appliance Manufacturers.*

Send for the Barber Burner literature, prices and discounts today.

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue, Cleveland, Ohio

Distributors—We have some excellent territory available for distributors familiar with gas burning appliances, who are able to open show rooms and who are able to finance their sales.





"from the revised ratings on boilers sold out here, it takes a weak mind and a strong back to get service out of them"

THESE words taken from a letter sent us by a heating engineer in Kansas City typify the general feeling existent today in all parts of the country regarding boiler ratings. It was the recognition of this condition and a desire to remedy it that led to the preparation of

Our New Book

"The Truth About Boiler Ratings"

It is a simple, common-sense explanation of this phase of heating. It contains complete and accurate information on the subject of boiler ratings. You will want to read this 32-page booklet—it is entitled, "Guaranteed Heating Satisfaction at Minimum Cost." You will want your prospective customers to read it. Without obligation to you we will gladly send you a copy with our compliments. Just fill out the coupon below and mail to us today.

THE H. B. SMITH COMPANY
Home Office and Works
Dept. J-1, Westfield, Mass.
Sales Offices and Warehouses at
Westfield Boston New York Philadelphia Cleveland

THE H·B·SMITH
BOILERS & RADIATORS
Used in fine homes and buildings since 1866

Mail this coupon for your free copy

THE H. B. SMITH COMPANY
Dept. J1, Westfield, Mass.

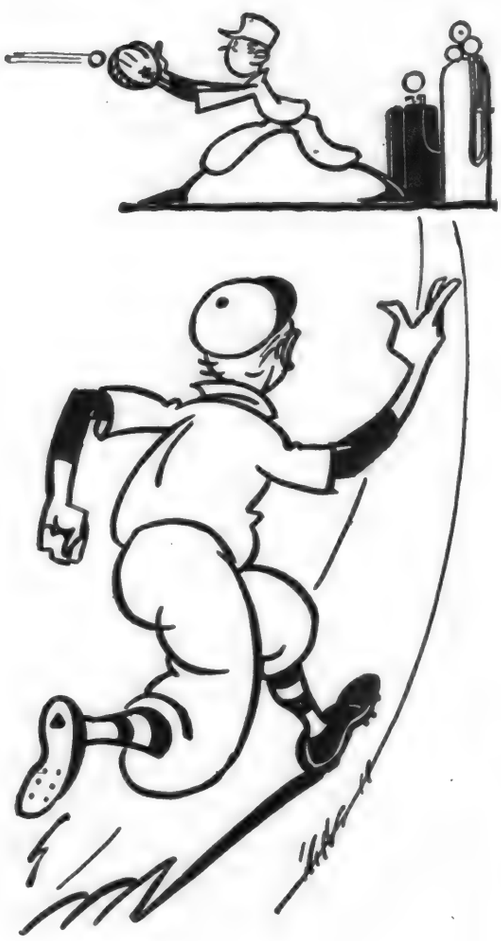
Gentlemen:—Please send me a copy of your booklet on boiler ratings, "Guaranteed Heating Satisfaction at Minimum Cost."

Name.....

Street.....

City..... State.....

What makes a double play?



GOOD FIELDING by the short stop is not enough. Second base must be covered, and so must first. Double plays are team plays and every man must play his part.

Oxy-acetylene welding requires double plays, too.

A good weld does not make oxy-acetylene welding an economical part of your business. The weld must be good, it is true; but in addition, the work must be handled rapidly and economically if the oxy-acetylene process is to become an integral part of your production.

In every Linde division office there is a Service Engineer. He is the "field captain" of the Linde Process Service in that division, and he "assists" the Service Operators and Service Supervisors to make oxwelding a part of your "team." He may suggest a better way to deliver work to your welders. He may design a new jig. He may even lay out a central welding department. But he can also demonstrate the desirability of welding and prove the strength of your welds to buyers of your products and to technical committees.

Service Engineers are a part of Linde Process Service and their help is free to Linde customers for the asking.

A double play in the welding pipe

A forty-mile pipe line had to be laid in a country where the temperature ranged from 30 below to 90 above zero. The engineers came to the reluctant conclusion that a welded line would not permit enough expansion. The Service Engineer calculated the expansion for them and convinced them that a special joint every two hundred feet would be adequate. In addition, he showed them how to "leap frog" their welding gangs from either end of the line, using only one gang to line up the pipe for each two gangs of welders. And so the company has a better and cheaper and more permanent line than they could have had without service.

THE LINDE AIR PRODUCTS CO.

General Offices:
Carbide and Carbon Building, 30 E. 42d Street
New York, N. Y.

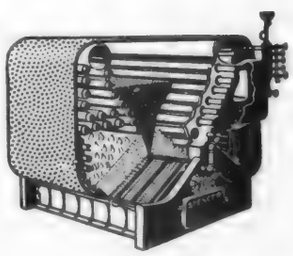
37 Plants *22 District Sales Offices* *91 Warehouses*

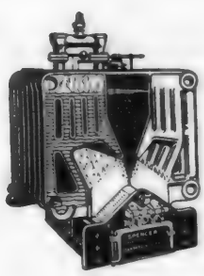
LINDE OXYGEN

YOU CAN DEPEND ON THE LINDE COMPANY

The public by thousands is turning to No. 1 Buckwheat Coal to save $4 to $7 per ton. That is why Heating Contractors are installing so many thousands of

Spencer
steam, vapor or hot water
Heaters
burn No. 1 Buckwheat coal





A size and type for every purpose *Sold only through heating contractors*

STANDARD HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.

New York City Boston Philadelphia Baltimore Buffalo Rochester Lancaster Detroit Schenectady Syracuse Harrisburg Scranton

Nothing to Crow About-

Fig. 74 Hot Water Radiator Valve

Fig. 223 Steam Radiator Valve

but merely a continuance of our policy of supplying to the trade the best valve possible to manufacture.

"Milwaukee" Radiator Valves are now available with molded composition handwheels. Beautifully finished and with knurled grip, these mushroom type handwheels add distinctiveness to "Milwaukee" Valves, millions of which are, and have been giving perfect service for twenty-four years. Every valve and its component parts are tested at 250 lbs. pressure before being shipped.

The quality of "Milwaukee" Radiator Valves is typical of the entire line of "Milwaukee" Brass Valves and ***"Milvaco" Heating Specialties.***

Your jobber can supply you. Representatives in all leading cities.

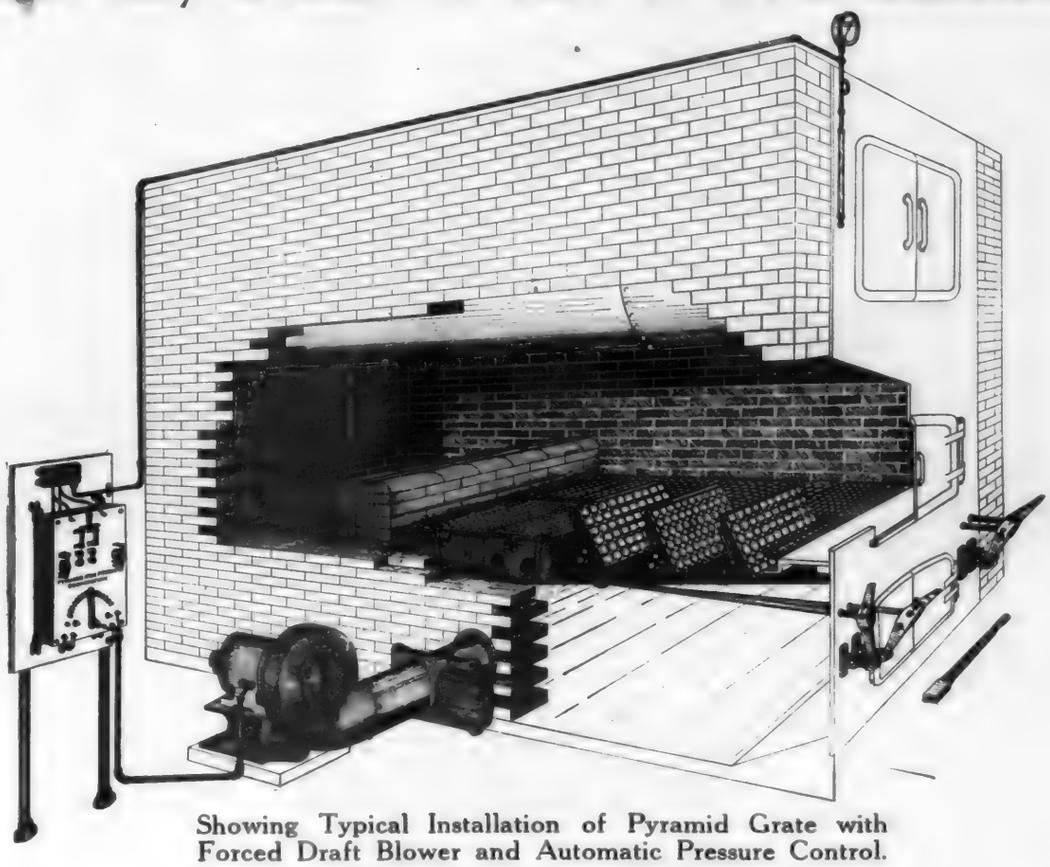
The use of a high grade product is economy — "Milwaukee" Valves are high grade and economical.

MILWAUKEE VALVE CO.

MILWAUKEE, WISCONSIN, U. S. A.

THE PYRAMID GRATE EQUIPMENT

Burns any Grade or Size of Coal Efficiently



Showing Typical Installation of Pyramid Grate with Forced Draft Blower and Automatic Pressure Control.

Three Thousand Installations

in New York District will not be shut down because of the coal strike, as PYRAMID GRATES burn Buckwheat or smaller sizes.

Many architects and engineers specify the PYRAMID GRATE. Why?

Because: It is scientifically correct; It is adapted for all types of boilers; Our organization is long established and in position to give the proper engineering service. *Write for Catalogue.*

PYRAMID IRON PRODUCTS COMPANY

136 Liberty Street, New York City

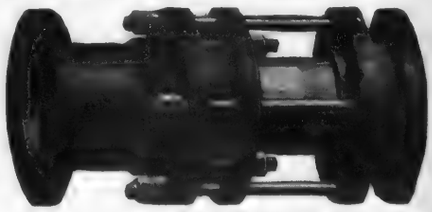
ADSCO EXPANSION DEVICES

Caring for expansion and contraction in all manners of steam and hot water piping has had the careful study of the American District Steam Company since 1877. In addition to the expansion devices shown, there are ADSCO Joints especially designed for each class of service. Use ADSCO Joints for satisfaction.

For High Pressure Service

Duplex-Sleeve Guided Type

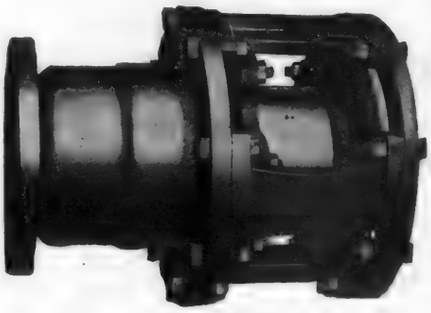
This joint is built for continued service under high pressures and super-heat. The Duplex feature of the slip preserves the packing and assures a tight joint under most severe conditions.



Tie Rod Type

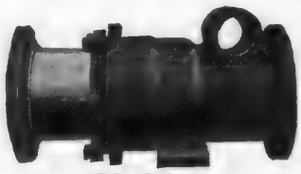
This semi-guided high pressure joint serves well where no unusual demands occur.

For Low Pressure



Model M

This guided joint for 125 lbs. pressure, with or without anchor base, supplies the need for a standard pressure guided joint easily examined and quickly repacked.



Model D

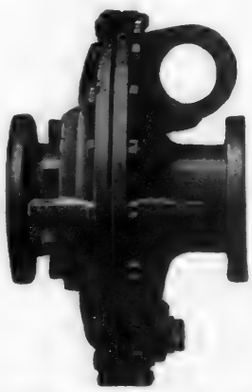
The ADSCO Model D is our special underground standard pressure joint. Cut above shows single joint and below double joint type. Thousands of these are used by District Heating Plants. Supplied either with or without anchor bases and service outlets.

Model K

The ADSCO Model K is the popular joint for standard pressures where no anchor nor service outlet is required.

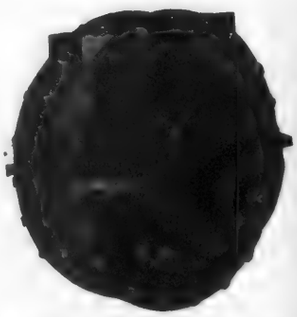
ADSCO VARIATORS

ADSCO Variators or Packless Expansion Joints will outlive the line itself and render uninterrupted service. Install them and forget them.



Model O Single for 50 lbs. Anchor and service outlets.

Model P Variator for 125 lbs. No anchor nor service outlets.



Model O Double for 50 lbs. Anchor and service outlets.

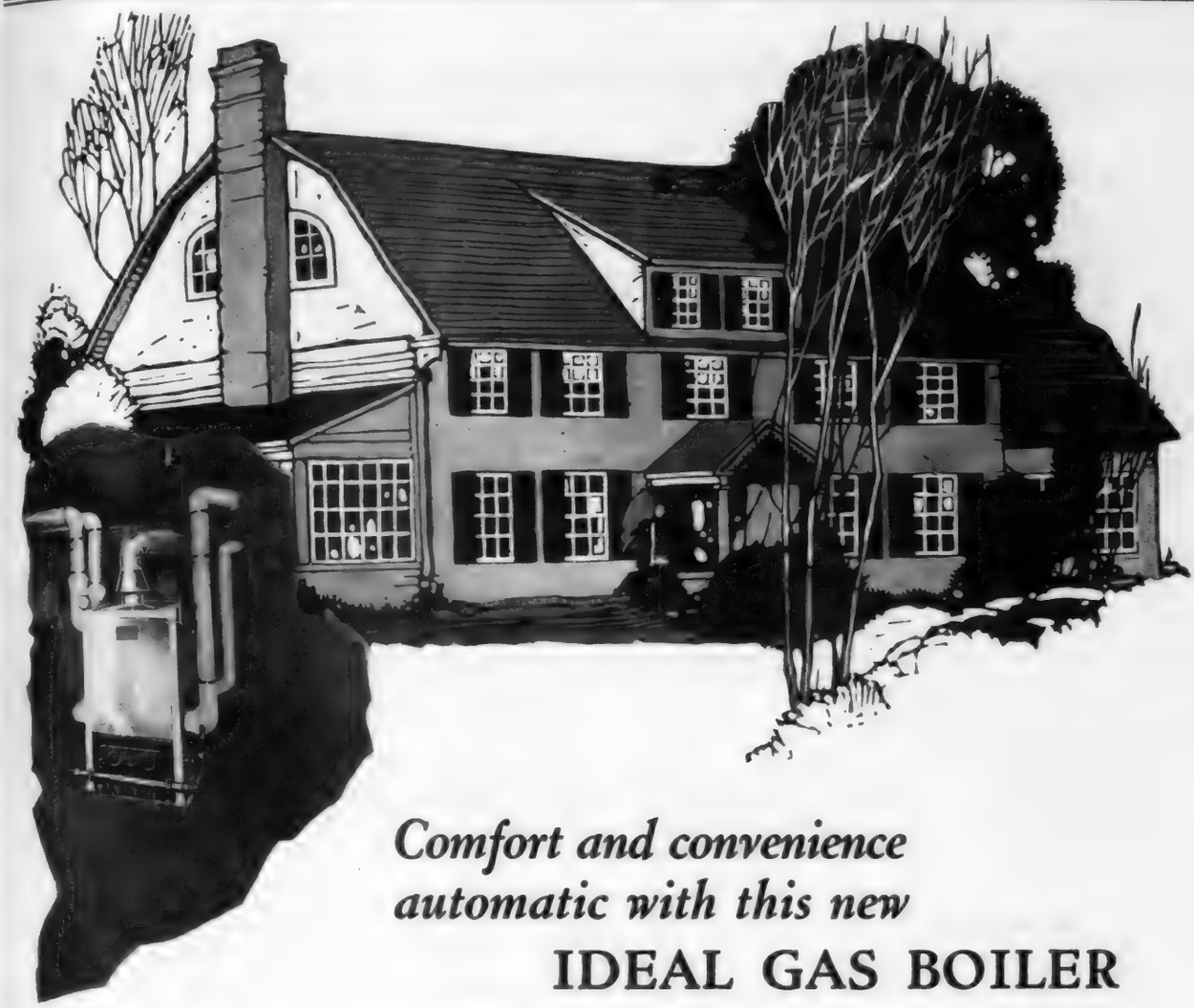
Send for Bulletin No. 182-H

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

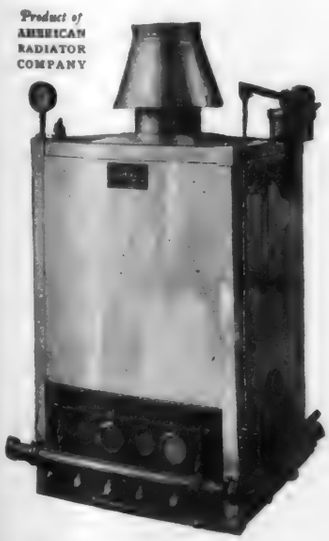
NORTH TONAWANDA, N.Y.

Offices: New York, Chicago, Seattle



Comfort and convenience automatic with this new
IDEAL GAS BOILER

Polished aluminum, asbestos insulated, encases this new high-efficiency IDEAL Gas Boiler. It is beautiful—and very different.



ANY well-built house, with a good coal-fired boiler may be *kept* warm and clean by working at it, but only with a Gas-fired Boiler will the house *stay* warm and clean *without thought or effort* from the owner.

This New IDEAL Gas Boiler, from the lighting of the pilot in the fall till its turning off again in the spring, delivers the pleasant, even warmth of summer—cleanly, efficiently, noiselessly, automatically. There is no fuel to handle, store or pay for in advance—no shortage, to send the thermometer down and the bills up.

A fine house without an IDEAL Gas Boiler is like a fine car without a self-starter.

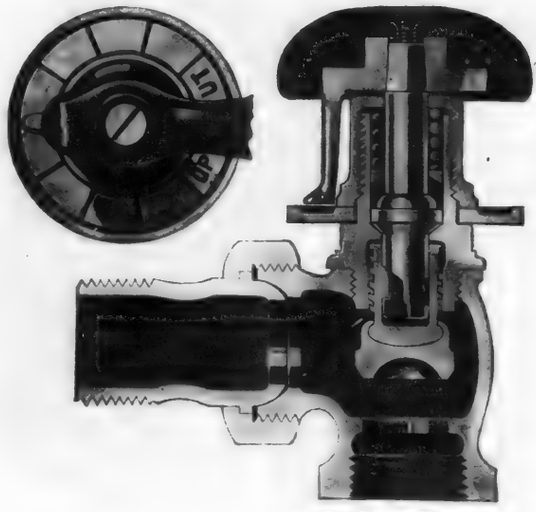
Your local gas company or we ourselves will gladly furnish comparative cost data. See them or write us for bulletins.

The A. H. Wolff Gas Radiator Company

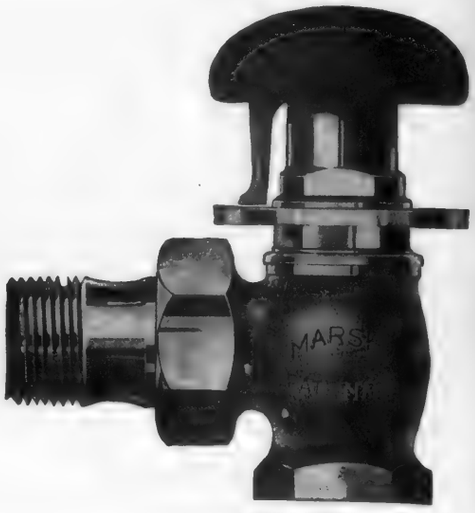
Distributors American Radiator Company's IDEAL Gas Boilers

376 Lafayette Street Dept.—G-56 New York City

Something Entirely New in Water Heat Regulation



Packless Feature



Graduated Fig. 139

We have made a special study of hot water heat regulation and control and are pioneers in the matter of individual radiator control, through a graduated valve, employing the same principle as with steam. If you can modulate, graduate, or regulate individual radiator vapor or vacuum steam heat through a valve (and you can), then why not by the same principle regulate water heat.

For Sleeping Rooms, heat regulation with the **Marsh Graduated** water valves may be controlled with the **same ease of operation and certainty of results** as is possible with a Modulated valve on a steam system, and **at a much less cost than for a vapor or vacuum system installation.**

Further, water circulation for each radiator, graduating for same or **balancing of system,** can be increased from nothing to full pipe capacity and **held or locked at any intermediate point,** if desired, by simply turning dial so that stop on same will register against indicator or pointer and locking dial in this position, preventing further opening of valve or turning of wheel or lever handle to the left.

These valves cost but little more than our regular water valves and **much less than steam modulated valves.**

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

Exclusive Sales Distributors

Appleton & Liptrott, Inc.
1480 Broadway, New York

Edward T. Hetherington,
1718 Sansom St., Philadelphia, Pa.

United States Radiator Corp'n
General Offices: Detroit, Mich.

All territory east of west lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

John W. Mabbs,
431 So. Dearborn St., Chicago, Ill.

Jas. P. Marsh & Company
118 So. Clinton St., Chicago, Ill.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County. "Chicago, Illinois."

HANDON

A FEW REASONS WHY HANDON CHARCOAL IRON BOILER AND TANK HEATER SALES ARE INCREASING:

1—There is no BETTER BOILER sold ANYWHERE at ANY PRICE.

2—A BETTER casting. Made of CHARCOAL IRON.

3—FULL grate area.

4—MORE prime heating surface.

5—Steams QUICKLY and RETAINS heat.

6—Long fire travel.

7—EXCELLENT SERVICE.

8—MADE RIGHT by expert foundry men.

9—Gives COMPLETE satisfaction.

10—The customer COMES BACK for more.

Send for catalogue and discount sheet

to

HANDON BOILER CORPORATION

General Office and Salesroom

101 Park Ave.,

New York, N. Y.

BRYANT HEATING

for Hot Water — Automatic Gas — Steam *or* Vapor

—a "Safe" Recommendation

It's a heating engineer's natural desire to specify carefree heating—providing he is absolutely certain there will be no discordant aftermath.

Fifteen years' reliable performance proves the sure dependability of Bryant Automatic Gas Boiler installation.

Your recommendations are backed by a nation wide organization who make it a major part of their business to give you whole-hearted co-operation.

—demands not even a glance for weeks at a time!

A few well-known architects who specify Bryant Heating. (Others will appear in later issues of this publication).

Earnest McGeorge
Cleveland, O.

G. C. Burroughs
Cincinnati, O.

James S. Nussear
Baltimore, Md.

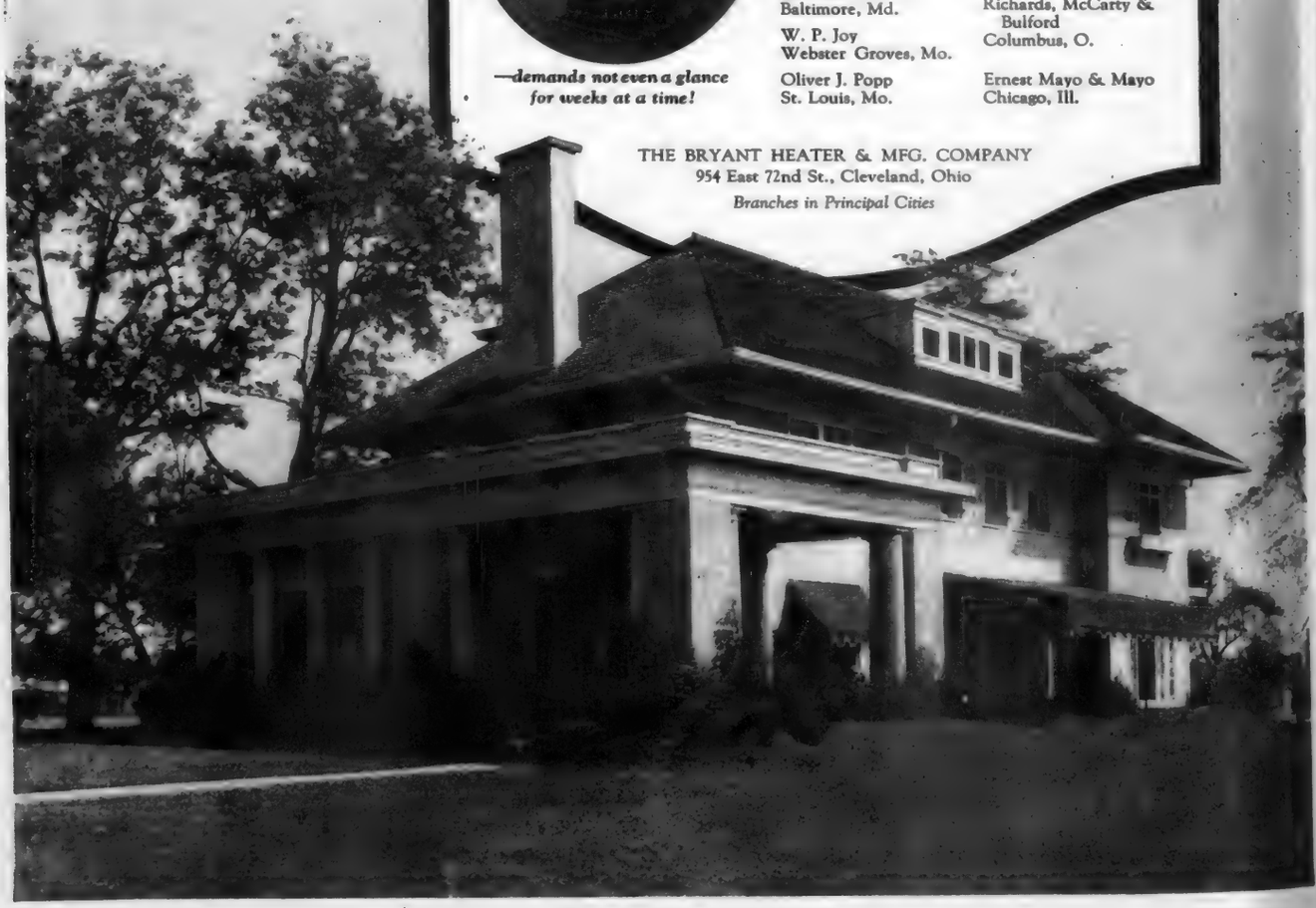
Richards, McCarty & Bulford
Columbus, O.

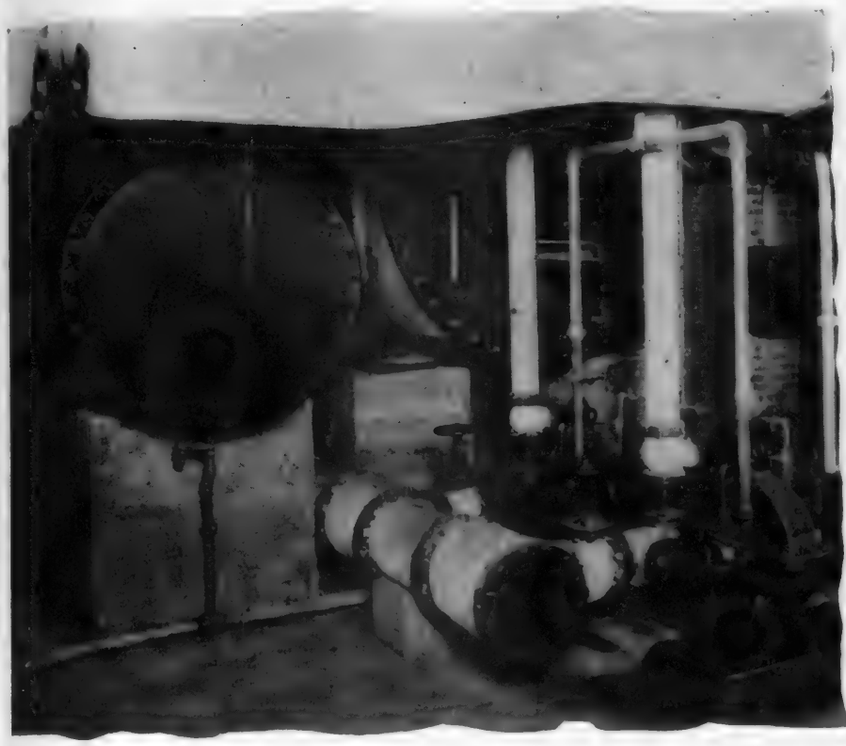
W. P. Joy
Webster Groves, Mo.

Oliver J. Popp
St. Louis, Mo.

Ernest Mayo & Mayo
Chicago, Ill.

THE BRYANT HEATER & MFG. COMPANY
954 East 72nd St., Cleveland, Ohio
Branches in Principal Cities





The Life-Saver of the Hot Water Piping System at the Benjamin Franklin Hotel

The Benjamin Franklin Hotel—Philadelphia's latest inn, a thirteen million dollar structure—opened its doors in January. The equipment is everywhere of the most modern, and every up-to-date convenience for the comfort of guests has been employed.

It is notable that the owners saw to it that the hot-water piping system was permanently protected against corrosion. Tucked away in the basement is the Elliott Deaerator unit pictured above. The Deaerator removes all free dissolved oxygen before the water goes into the piping system, thus making corrosion impossible. It constitutes an investment in the form of an insurance policy on the piping system, at the same time guaranteeing guests against discomfort and annoyance due to red water, stained linens and fixtures, etc.

Such an installation is always a paying investment for any hotel or building using large amounts of hot water.

There is a type of Elliott Deaerator or Deactivator suited to the needs of any building. Ask for our bulletin "Water—But No Corrosion."

ELLIOTT COMPANY

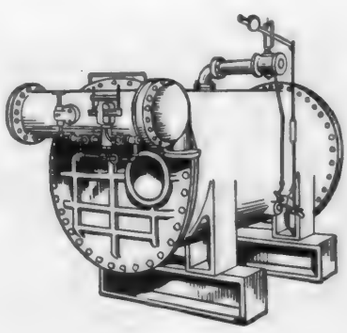
Pittsburgh, Pa.

General Sales Offices: Jeannette, Pa.

District Sales and Service Offices: Atlanta, Baltimore, Boston, Cincinnati, Cleveland, Chicago, Detroit, Kansas City, New York City, Philadelphia, Pittsburgh, and St. Louis

N-838

De-oxygen-ating Deactivators



Apparatus Deaerators

U. S. NAVY OFFICIAL PHOTO—NAVAL AIR STATION, SAN DIEGO, CAL.

POSITIVE CIRCULATION

—regardless of the distance between central plant and farthest radiator, because an

ILLINOIS HEATING SYSTEM

is installed. When you add to this feature the items of Noiseless Operation, Quick and Easy Control of room temperature, Fuel Economy and Durability, you will realize why Illinois Heating Systems are specified in the foremost buildings and groups of buildings in the country.

Illinois Products have been the accepted standard in Quality Heating for the last 25 years. From the radiator to the boiler their use assures you complete satisfaction.

Through our Engineering Department you may have any detailed information that you require. Bulletins No. 12A and No. 21A will be gladly sent on request. Your telephone directory will give you the address of our local office.

REPRESENTATIVES IN 40 CITIES OF U.S.A.

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD President INCORPORATED 1900

CHICAGO

Save Money on COAL!

Use BARNES & JONES

Vapor and Vacuum Heating Systems

Secure Proven Fuel Economy and Real Satisfaction

WITH the Barnes & Jones type of heating system 34% of coal has actually been saved. Could there be any more appropriate time or place to call your attention to this important fact than in this magazine which is devoted wholly to "Fuel Conservation"?

TWENTY years ago the director of the Mechanical Engineering Department of the University of Pennsylvania, Professor Henry W. Spangler, showed that an open return line heating system of the Barnes & Jones type was decidedly more economical in the use of steam than an ordinary two pipe low pressure steam system with air valves and hand valves on the radiators.

IN one particular building, Professor Spangler showed that the Barnes & Jones type of system effected a direct money saving of 34% over an ordinary two pipe system.

VAPOR *and* VACUUM HEATING SYSTEMS *of* PROVEN QUALITY

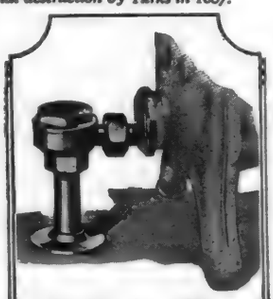
Barnes & Jones

5 Melrose Street **Boston, Massachusetts**

The Parthenon at Athens (called by many the most beautiful building in the world, due to the sheer magic of its simplicity) as it appeared from 400 B. C. until its partial destruction by Turks in 1687.

SIMPLICITY

Recognizing that Simplicity in a heating system is of paramount importance, the Dunham System of Heating has been designed to offer the greatest amount of efficiency with the utmost simplicity of both construction and operation.

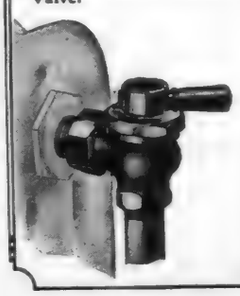


The Dunham Thermostatic Radiator Trap

The silent, efficient watchdog of the coal pile.

The Dunham Packless Radiator Valve

A fitting companion to the Dunham Trap is the Dunham Packless Radiator Valve.



THE Dunham Heating System is so simple in operation that it may be handled by inexperienced employes in commercial, industrial and apartment buildings, or by women and children in residences.

Any radiator in a Dunham System may be turned off when not required. Radiators in rooms not in use may be shut off from the rest of the system. The heat of those in service may be controlled in the room and without visiting the boiler room.

In a Dunham System there are no complicated and delicate parts to get out of order or to require constant attention. There are no trouble-making air valves.

Simplicity, then, is as outstanding a characteristic of a Dunham System as is the satisfaction its installation affords.

Over sixty branch and local sales offices in the United States and Canada bring Dunham Heating Service as close to your office as your telephone. Consult your telephone directory for the address of our office in your city.

C. A. DUNHAM CO.

230 East Ohio Street · · CHICAGO

The DUNHAM REG. TRADE MARK HEATING SERVICE

One-Piece Multiflex Bellows are manufactured in all sizes for our own products. Manufacturers using or contemplating the use of bellows will find a reliable source for their requirements at our factories. Full information upon request.

Dependable Equipment

IN the manufacture of thermostatic traps or heating specialties, pneumatic valves or temperature control equipment, or other fields in which The Bishop & Babcock Mfg. Co. is engaged, the engineering and manufacturing facilities of the Company have always been adequately provided to insure a product of highest quality without dependence on outside sources for any part of the finished product.

This is strikingly true in the instance of products containing Multiflex Seamless Metal Bellows, which are used in the most advanced types of appliances in the heating specialty and temperature control fields. The Bishop & Babcock Mfg. Co. has always manufactured its own Seamless Multiflex Bellows, and through progressive improvement in manufacturing processes under their own direction are making a paramount product of its kind.

When you see the trade name MULTIFLEX on a product, it reflects a unification of interest with a single aim of progressive development and highest quality in its manufacture.

THE BISHOP & BABCOCK MFG. CO.
General Offices and Factories Cleveland, Ohio
Offices in Principal Cities

BISHOP & BABCOCK
HEATING SPECIALTIES

No. 1 Pressure Regulator—Piston Type
Made in sizes ¾ to 14 in. inclusive—Std. and Ex. Hvy.
Sizes 1½ in. and under made with bronze bodies—screwed ends only.
Sizes 2 to 6 in. inclusive made with iron bodies—screwed or flanged ends.
Sizes 7 in. and above made with iron bodies—flanged ends only.

KLIPFEL
PRESSURE REGULATORS

Automatically reduce any initial steam, air or water pressure to any desired reduced pressure above 2 lbs.

Maintain reduced pressure constantly regardless of fluctuations in boiler pressure, or changes in the demand for steam.

Simple, rugged and direct acting. As low pressure builds-up and exerts pressure under piston, a balance is formed between low pressure and weighting, which in turn regulates the inner valve opening.

Visible in action. Lever may be used to open, close or test by hand. Position of inner valve may be easily judged by looking at the lever.

Bronze cylinder, multiple grooved piston and balanced plunger type bronze inner valve. All working parts removable while valve body remains in the pipe line.

No troublesome springs, toggles, packing boxes or pilot valves. Dashpot included, which insures steady service pressure and overcomes any tendency of valve to chatter or vibrate.

Guaranteed to closely regulate at maximum steam loads, as the capacity—size for size—is equal to or greater than that of any competing pressure regulator.

We Invite Correspondence.

KLIPFEL MFG. CO., 2641-59 W. Harrison St. CHICAGO, ILL.

Manufacturers of a Complete Line of Steam Specialties including Expanded Outlet Pressure Regulators (Both Piston and Diaphragm Types)—Float Valves—Pump Governors—Back Pressure Valves—Relief Valves—Grease Traps—Steam Traps and many other Specialties.
Sold by Leading Jobbers in all Principal Cities—Write for Catalog No. 20.

IRON BODY GATE VALVES

SCREWED, FLANGED AND HUB END STYLES

NON-RISING STEM AND O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway ⋈ ⋈ **Chicago, Ill.**

Aerial View of the University of Notre Dame, Notre Dame, Ind. Founded 1843. Present enrollment more than 2100 students. This large group of buildings is heated thruout by a Webster Vacuum System of Steam Heating from a central heating plant.

"—dated June 27th, 1899"

THERE is a wide difference between sales and service—a wide difference between promise and performance ..... *Witness:* the Webster Vacuum System installation at the University of Notre Dame.

The first proposal for a Webster Vacuum System was dated June 27th, 1899. The first Webster installation was completed in 1900 and contained 16,913 square feet of radiation ..... And then—twenty five years of Webster Service ..... As additions and changes were made the Webster Vacuum System kept pace with the growth of the institution. New developments in the art of heating were promptly incorporated as the system was extended to all the new buildings. Today this 25-year-old Webster Vacuum System of Steam Heating is thoroughly up to date and contains 99,080 square feet of radiation.

We would like to give you the inside facts on Webster Service ..... We would like to tell you how Webster Service is working *with* architects, engineers and heating contractors—getting on the job at an early stage in the planning and never quitting during the life of the installation.

It pays to concentrate on selling and installing WEBSTER SYSTEMS of STEAM HEATING in small towns as well as big cities. One contractor* has installed 82 Webster Systems—52 of them in his home town of less than 5000 population. He had no competition on most of them. Are you overlooking this opportunity? Ask us about it.

* Name on request.

Warren Webster & Company

Pioneers of the Vacuum System of Steam Heating

Camden, N. J. **50 Branch Offices**

In Canada, Darling Bros., Ltd., Montreal

– since 1888

Webster

Systems of Steam Heating

More than 34,000 installations in America's finer buildings

Low Pressure and Perfect Control Mean Fuel Economy

A low pressure properly controlled is the reason for the economical and highly efficient operation of the Mouat Vapor Heating System.

This low pressure, which is maintained by the Mouat Damper Regulator is sufficiently sensitive to operate at a variation of less than one ounce. The necessity of only a moderate fire to successfully operate the Mouat System means a great saving in the coal pile.

Besides being economical, the Mouat System is simple to operate, and lacks mechanically operated and intricate parts. Its efficiency is not effected by rapid changes or extremes in temperatures. It is flexible and meets all demands, and is adaptable to any type of building. ***Let us send full particulars.***

MOUAT VAPOR HEATING COMPANY
CLEVELAND, OHIO

A Residence in Cleveland Heights, Ohio

VAPOR MOUAT HEAT

IN THESE BUILDINGS.

Good Samaritan Hospital, Vincennes, Indiana

THE W.D. CASHIN CO. THERMOFLEX

Low Pressure Automatic Boiler Feeder

AUTOMATIC POSITIVE NON-FLOODING

Is fully described in bulletin No. 50. Let us send it to you. Is also made with an overflow feature if desired for abnormal cases.

WHY NOT?
ORDER ONE FOR TRIAL

MANUFACTURED BY

W. D. CASHIN COMPANY

35 HARTFORD STREET :: :: BOSTON, MASS.

Mica Insulation!

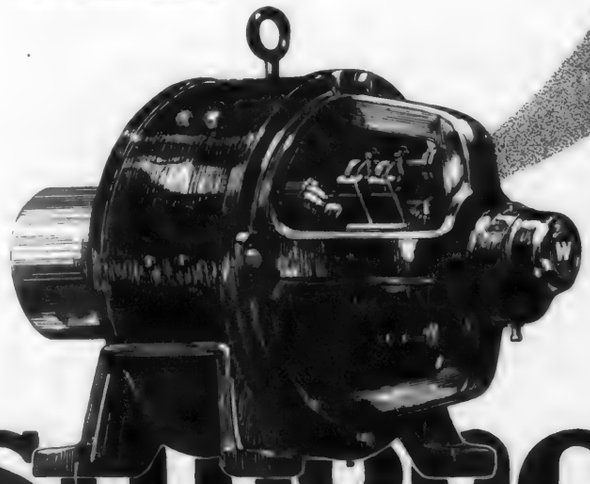
That Added Touch of Quality in Westinghouse Motors

WESTINGHOUSE Research Laboratories have found mica to be the best insulation material obtainable. It has moisture and temperature-resisting characteristics, as well as high dielectric and mechanical strength, to a greater degree than any other known insulating material.

This mineral is the most expensive, yet Westinghouse uses it generously for all coil insulation to add years of life and reliability to all Westinghouse motors.

Mica is that added touch of quality, characteristic of Westinghouse practice to build better motors by the use of the best materials obtainable.

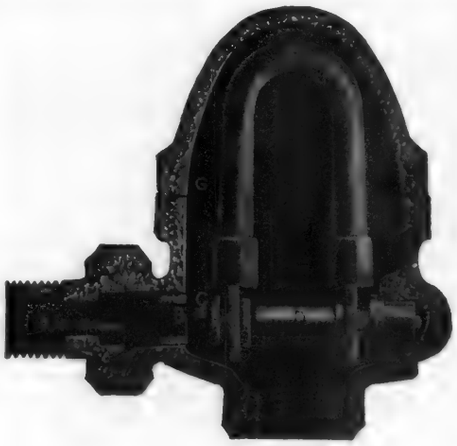
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH PENNSYLVANIA
Sales Offices in All Principal Cities of the United States and Foreign Countries



Divide Their Cost By the Years They Last

Westinghouse

X 82173



The Perfect Automatic Valve for Vacuum or Vapor Heating

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

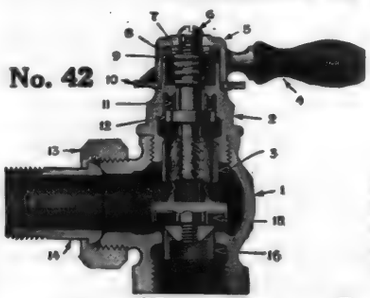
Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

Send for booklet

WILLIAM S. HAINES & CO.
12th & Buttonwood Streets
PHILADELPHIA, - - PA.

VENTO

McALEAR SPECIALTIES FOR VAPOR HEATING SYSTEM



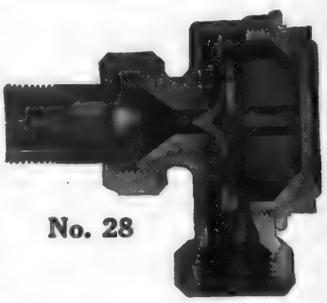
No. 42

Packless Radiator Valves

Quick-opening, nickel-plated brass body. Fig. 38, angle pattern, wood wheel handle; Fig. 42, angle pattern, graduating type, lever handle.

Radiator Traps

Discharge air and water in large quantities. Close tight against steam. Noiseless in operation. Nos. 28 and 28-A of steam metal, furnished N. P. unless otherwise specified. Nos. 28-A and 29-A have right and left-hand discharge openings. Nos. 29, 29-A, 33, 34 and 36 have iron bodies and brass caps, furnished plain unless otherwise specified.



No. 28

Vapor Damper Regulators

No. 58

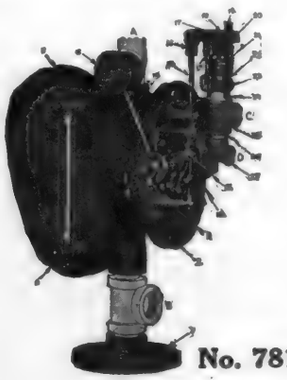
All metal, tapped for 1-inch steam pipe connection. Shipped complete with lever and two weights, S hooks, 2 ceiling pulleys and 12 feet of No. 10 plumbers' chain.

No. 56 for 0 to 3 pounds pressure, constructed with bellows of 10-inch flexible walls. No. 58 for 1 to 15 pounds pressure, constructed with bellows of 6-inch flexible walls.

Combination Float and Thermostatic Ball Check Valves

For venting supply and return mains of heating systems. These air valves close tight against water and steam, and by use of the check prevent the atmospheric pressure from entering the discharge opening.

No. 15



No. 781

Air Eliminator and Return Traps

For automatically returning the water of condensation direct to boiler and discharging air. Minimum distance between water line of boiler and bottom of trap should be 18 inches. "A"—inlet to trap; "B"—discharge to boiler; "C"—steam connection to boiler; "D"—air vent.

THE McALEAR MFG. CO.
1901-7 S. Western Ave.
CHICAGO, ILL.

From Boilers to Farthest Radiators

10 Buildings—18,000 Sq. Ft. of Radiation
One Central Boiler Plant—Unit Ventilation

and the

O-E 3-IN-1 HEATING SYSTEM

Entire System Operating by Gravity—Complete Circulation on Less Than Ounce Pressure

No Vacuum Pumps
No Condensation Pumps
No Receivers
No Tilting Tanks
No Equalizing Devices
or Like Complicated
Mechanisms Required
Single or Group Buildings
O-E Renders the Maximum
in Heating Efficiency
None too Large
None too Small

More Heat—Less Fuel

O-E Specialty Mfg. Co.

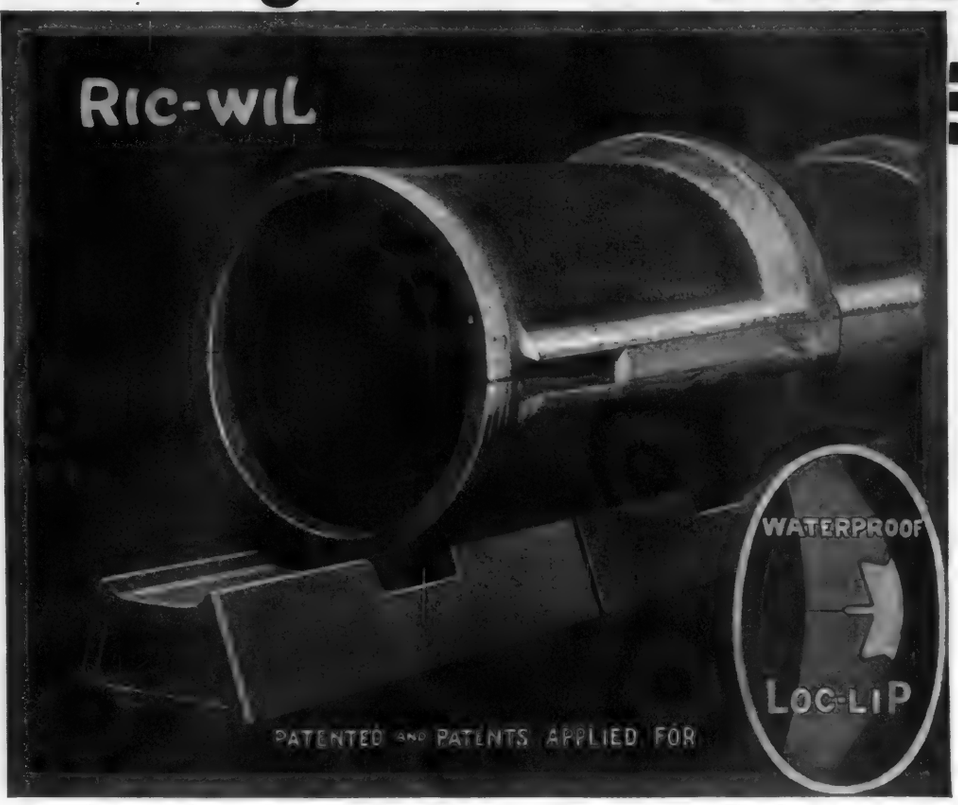
12 Keefe Ave. Milwaukee, U. S. A.

Mr. WM. GALENA
HEATING CONTRACTOR

States that after installing this and many other OE Systems that he is so convinced of the efficiency and economy of the OE 3-IN-1 System that he is willing to install an OE job, accepting a small initial payment, the balance to be derived from a part of the saving effected in the consumption of fuel.

At Last!

an underground conduit that has



THIS new Ric-wiL Loc-liP Joint is the most important development in the engineering of underground conduit since the Ric-wiL Base Drain was placed on the market.

Like every other Ric-wiL feature, it is the result of practical experience in the field. The idea started with construction men who install Ric-wiL; Ric-wiL engineers perfected it. Its installation on a variety of different jobs has proved its success from every point of view.

Added to the exclusive Ric-wiL features of a supporting Base Drain, inter-locking construction throughout, external pipe supports, and special systems of insulation, it gives you guarantees of economy of installation, unusual dry efficiency and an everlasting durability not obtainable in any other underground conduit.

THE RIC-WIL COMPANY, Cleveland, Ohio

been made everlastingly water tight!

Ric-wiL *with the practical and leak-proof new* Loc-LiP *Joint~*

IN the job of installation and in enduring efficiency, this new Ric-wiL Loc-liP Side Joint has seven important and exclusive advantages:

1. Water-Tight
The joints between top and bottom sections of conduit are completely sealed with cement, plenty of it, and it's locked in. Tests in which the conduit was kept under a foot of water for long periods prove it absolutely leak-proof.

2. Unusual Strength
The Loc-liP Joint restores the split tile to a strength greater than it had before splitting. This fact plus the fact of Ric-wiL's great natural strength assures a solid durability equal to any job.

3. Locked Joint
The Loc-liP is shaped so that it actually locks the cement in place and locks the two halves of conduit together. Even with the supporting drain removed, the bottom half will not fall out of place.

4. Fool-Proof
The new design makes top and bottom conduit halves interchangeable because exactly alike. It is impossible to install Ric-wiL Conduit up-side-down.

5. Easy Cementing
Joints no longer require cementing at the time top sections are set on. This allows a whole run to be cemented from one mix—quickly and more efficiently.

6. Visible
The Loc-liP is an outside joint and fully visible. Inspectors can tell by a glance from the top of the trench that the cement has been properly applied.

7. Permanent Protection of Insulation
Whatever insulation is used, you can depend on Ric-wiL with this Loc-liP Joint to keep it dry and therefore at its best efficiency—ALWAYS!

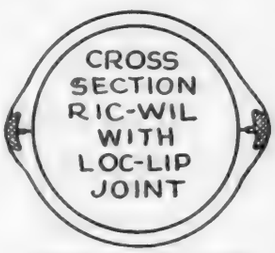
Write at once for further information

THE RIC-WIL COMPANY, Cleveland, Ohio

RIC-WIL
UNDERGROUND CONDUIT

Weak joints, insufficient cementing surface, almost impossible to make or keep water-tight.

Free from weaknesses of ordinary conduit. Sound intermediate step toward new style Ric-wiL with Loc-liP Joint.

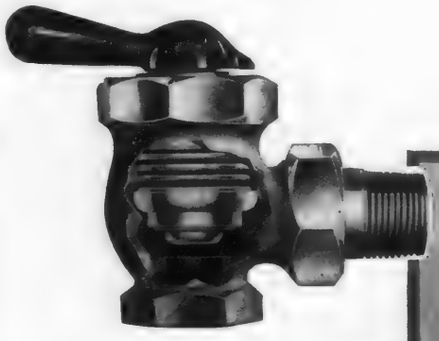


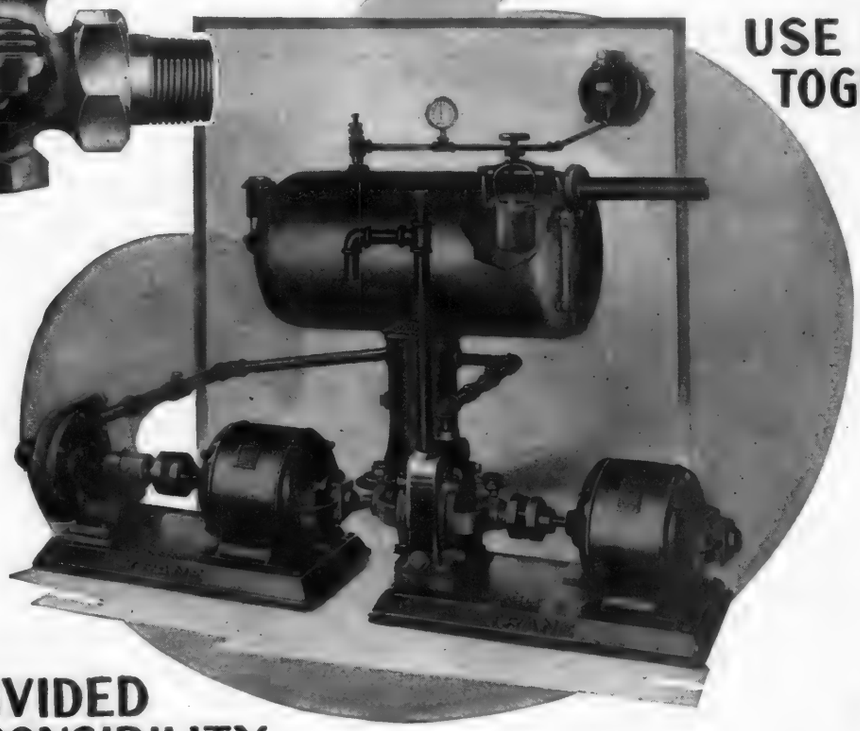
Greatest possible strength and rigidity with joint made absolutely water-tight.

New style Ric-wiL with Loc-liP Joint being installed by The Cleveland Electric Illuminating Co., Cleveland, Ohio.

TRANE'S BIG THREE

BELLOWS PACKLESS VALVE+BELLOWS TRAP+VACUUM PUMP





USE THEM TOGETHER

UNDIVIDED RESPONSIBILITY

Trane Bellows Trap 14 corrugations. Bellows 1¾ inch in diameter. Brass body. Normal range 15-inch vacuum to 25 pounds pressure. Guaranteed 5 years. Described in Bulletin 14.

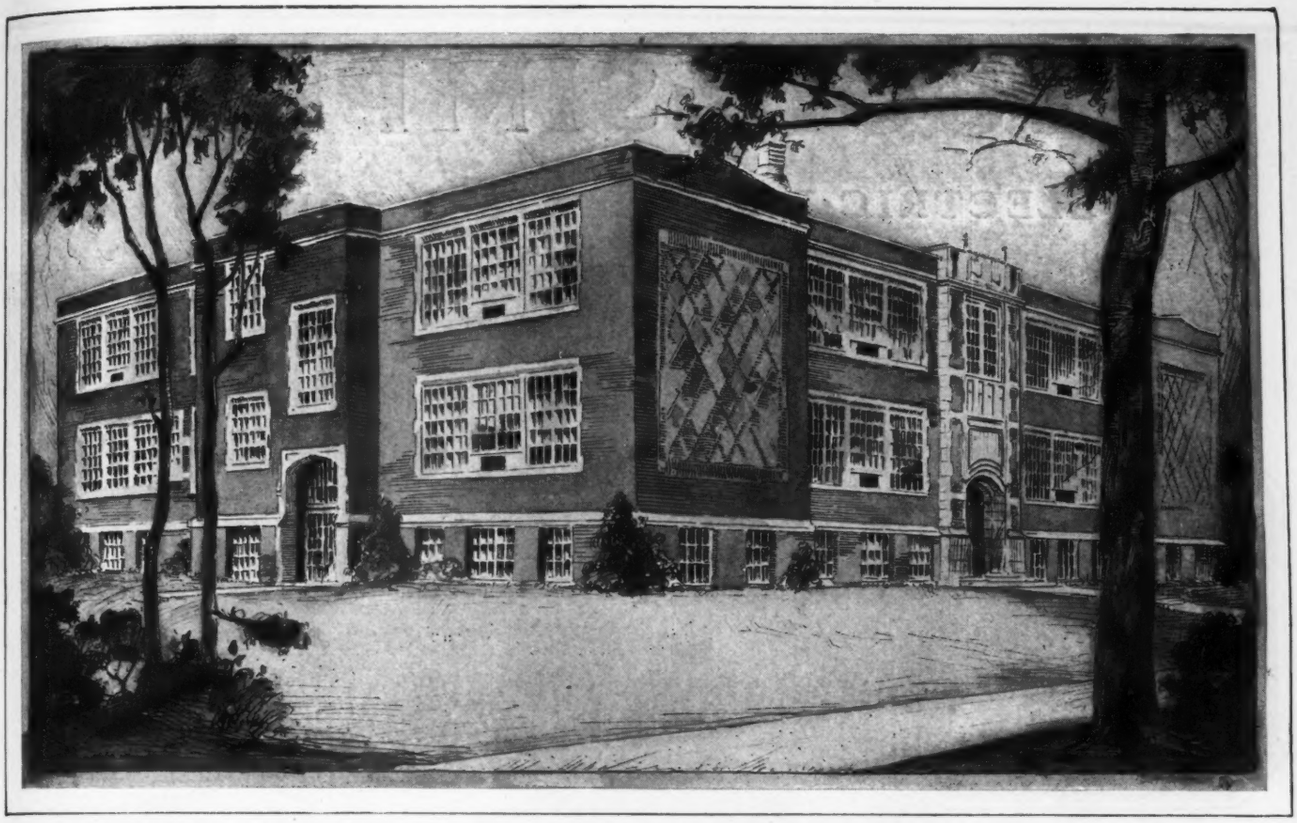
Trane Bellows Packless Valve Absolutely packless in every respect. Contains genuine Trane Bellows. Brass body. Indestructible handle. Described in Bulletin 14.

Trane Vacuum Pump Separate Case Construction. Single or two-motor drive. 350 combinations. Pedestal type tank with built-in strainer. Less motor horsepower for a guaranteed capacity than any other vacuum pump ever designed. Described in Bulletin 20.

Write for the Trane Bulletin Binder, describing the entire line of Trane Heating Specialties and Trane Pumping Equipment.

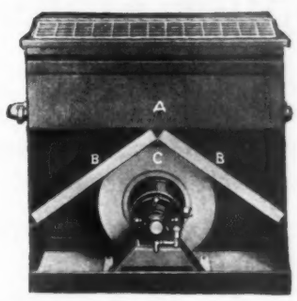
HEATING TRANE PRODUCTS PUMPING

THE TRANE COMPANY, 206 Cameron Ave., La Crosse, Wis. Manufacturers of vapor and vacuum heating specialties and pumps. Branches and sales connections at New York, Chicago, Boston, Philadelphia, Buffalo, Cleveland, Detroit, Seattle, Los Angeles, Albany, Minneapolis, Salt Lake City, Ft. Wayne, Portland, Ore., Greensboro, N. C., Zanesville, Ohio, Atlanta, Ga., Des Moines, Ia. In England: 22-23 Clerkenwell Close, London, E. C. 1. In Canada: The Trane Co., 23 River St., Toronto; Thomas Robertson & Co., 134 Craig St., West, Montreal; F. S. Murdoch, 310 Breadalbane, Winnipeg. In Japan: The Uchida Trading Co., Ltd., Tokio—Osaka—Kobe. In China: C. J. Doughty & Co., 7 Jinkee Road, Shanghai.



NATHAN HALE SCHOOL, NEW HAVEN, CONN., UNIVENT EQUIPPED. LEO. SETLOW, NEW HAVEN, CONN., *Contractor*
D. J. MAHONEY, *Chief Engineer, Board of Education*

Progress in Ventilation



Open view of* UNIVENT *illustrating

A.—Copper radiator without a single joint, absolutely leak-proof.

B.—Air filter easily removable for cleaning.

C.—Cone type fan specially insulated for quiet operation.

UNIVENT
(TRADE MARK)
Ventilation

You know your success depends on keeping step with progress.

In the last few years progress (proven by modern demand) calls for the Univent System of Ventilation in schools.

A study of the situation will naturally show you that your profit and the satisfaction of your customers lies in recommending and installing the Univent. For the Univent gives 100% unit ventilation. It brings fresh air direct from outdoors to each room, cleans it when necessary, warms it and discharges it in a vertical jet which insures agreeable air motion without draft.

The Univent is adaptable to any school building or office building where flexibility and positive ventilation are demanded.

Write for Architect and Engineer's Edition of Univent Ventilation. It shows why better schools everywhere, both old and new, are installing the Univent.

THE HERMAN NELSON CORPORATION *Moline, Ill.*

1945 Third Avenue

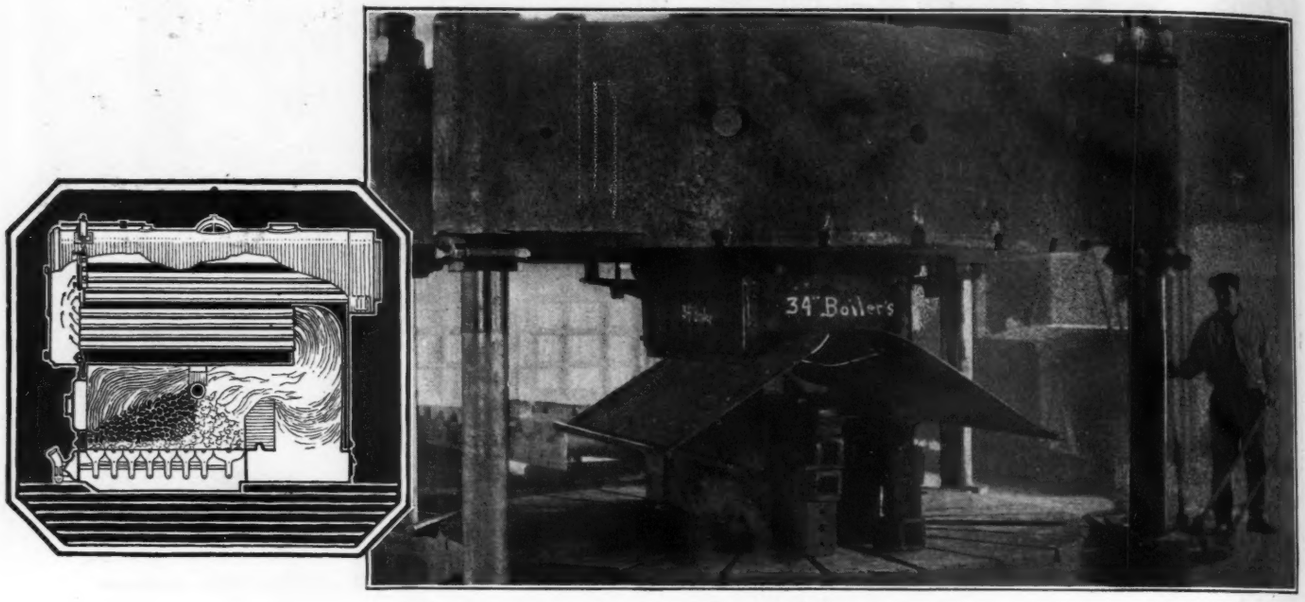
Branch Sales and Service Stations

BELFAST, ME.	PHILADELPHIA	CLEVELAND	DES MOINES	EMPORIA	SPOKANE
BOSTON	SCRANTON	COLUMBUS	MILWAUKEE	OMAHA	PORTLAND
NEW HAVEN	PITTSBURG	TOLEDO	MINNEAPOLIS	KANSAS CITY	SEATTLE
NEW YORK CITY	GRAND RAPIDS	INDIANAPOLIS	ST. LOUIS	DENVER	VANCOUVER
SYRACUSE	DETROIT	CHICAGO		SALT LAKE CITY	TORONTO

HEGGIE-SIMPLEX

[FORMERLY SIMPLEX]

ELECTRIC-WELDED STEEL BOILERS



Made of *Firebox* Low Carbon Steel— the Quality Standard among Boiler Materials

The Heggie-Simplex boiler combines in one portable, electric-welded steel unit all the recognized advantages of both firebox and return tubular, double pass boilers. It has four distinctive features of fundamental importance:

1. Extra large firebox and *direct* heating surface.
2. Secondary combustion chamber to provide ample room for complete combustion before entering flues.
3. "Rear-front-rear" passage for the gases.
4. A single, unimpeded, freely circulating body of water.

Made in a complete range of sizes for bungalows, residences and all larger installations.

WHEN you see a steel plate going into the presses at the big Heggie plant, you know that it is genuine *firebox* steel of low carbon content—guaranteed to work up without brittle spots into a tenacious and practically unbreakable unit.

You also know that it is as heavy a plate as any ever used in boilers of similar size — and heavier than most.

This same care of quality follows through every detail of material and manufacture. From the first day when this unique, portable steel boiler is carried in and connected, this policy assures you of uninterrupted satisfaction.

Upon request—a simple, accurate chart and description showing how the Heggie-Simplex saves 25% to 45% of the fuel, burns *any* fuel smokelessly, reduces firings by 50%, saves 33% the floor space, flues clean from the front—and how much more simple and less expensive to install.

HEGGIE-SIMPLEX BOILER COMPANY, Joliet, Illinois

Representatives in

Akron	Casper	Dayton
Albuquerque	Charlotte	Denver
Amarillo	Chattanooga	Detroit
Atlanta	Chicago	Duluth
Baltimore	Cincinnati	Elmira
Birmingham	Cleveland	El Paso
Buffalo	Columbus	Harrisburg
	Dallas	

ELECTRIC-WELDED HEGGIE-SIMPLEX STEEL BOILERS

Representatives in

Houston	Nashville	Rochester
Joliet	New Orleans	San Antonio
Kan. City, Mo.	New York	Schenectady
Little Rock	Okla. City	Shreveport
Lubbock	Omaha	Spartanburg
Memphis	Philadelphia	St Louis
Minneapolis	Pittsburgh	Tampa: Toledo
	Raleigh	

Just look up "Heggie-Simplex Boiler Co." in the phone book in any of the above cities for representative's number and address

The Heating and Ventilating Magazine

VOL. XXII Reg. U. S. Pat. Off. Reg. Canadian Pat. and Copr't Off. No. 9

Contents for September, 1925

The Line of Advance in the Coal Field.....*David Moffat Myers* 55

Small-Sized Anthracite the Key to the Hard Coal Fuel Conservation Problem 56

Heating New England Homes With Gas..... 59

How They Save Fuel in Kansas.....*John H. Kitchen* 64
Effective Combination of Direct Transmission Air Heaters and Steam Boiler in a Junior High School Building.

Boiler Ratings and Fuel Conservation.....*Ray A. Small* 68
Progress of the Boiler Calibration Movement in Wisconsin and What It Has Accomplished to Date.

The Iso-Degree-Day Chart.....*P. E. Fansler* 73
An Important New Graphic Method of Showing Heat Requirements in any Locality in the United States and Canada.

Home-Study Course in Gravity Steam and Water Heating.....*Ara Marcus Daniels* 75
Lesson No. 11—Forced or Accelerated Water-Heating Systems.

Halving Heating Costs with Central Station Steam.....*Samuel R. Lewis* 82
Notable Example of Economies Secured in Heating and Ventilating a Lodge Building.

House-Heating By Combining the Use of Gas and Oil.....*Henry O. Loebell* 84

The Wisconsin Code as a Model for Other States..... 89
What the Leaders of the Industry Have to Say on The Heating and Ventilating Magazine's Proposal.

Appendix to Wisconsin Code on Heating and Ventilation..... 90

Clock Thermostats and Oil Burners.....*H. W. Sweatt* 92

Tight Longitudinal Joints for Split-Tile Pipe Conduits..... 93

American Society of Heating and Ventilating Engineers..... 94
The New Director of the Research Laboratory.

Correspondence 95
Use of Central Vent Flues in Corridors.
Sluggish Circulation of Water Due to Slight Motive Head.
Size of Boiler and Pipe Coil Required for Heating Water.

Seattle's Electric Heating Era..... 97

European Design for Panel Heating with Gas..... 97

Where Coke Fits Into The Fuel Conservation Movement..... 98

Saving Heat by Recirculating Filtered Air in a Tool Room..... 98

Recent Developments in House-Humidifying Devices..... 99
Difficulties Encountered in Humidity Control in the Average Residence and Methods for Remedying Unduly Dry Air Conditions.

Computing Roof Losses..... 101

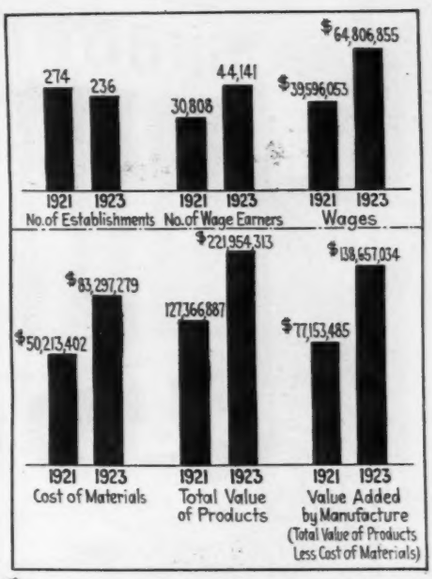
Heating and Piping Contractors' National Association..... 101
Recent Committee Appointments.

Present Accepted Practice in Domestic Oil Burners..... 108
6.—Caloroil.
7.—Oil-O-Matic.

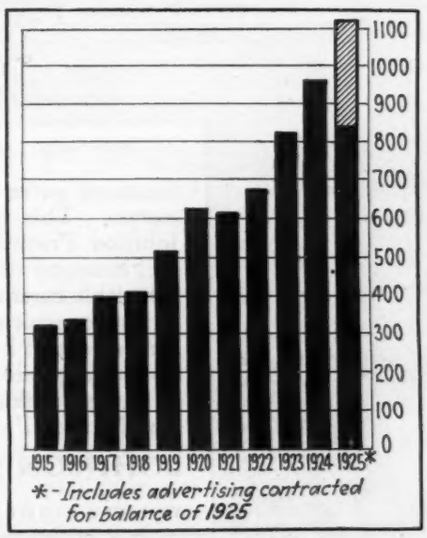
Standard Heating and Ventilating Data Sheets.....**Supplement**
No. 5—The Iso-Degree-Day Chart.

Engineers' Specification Index, Page 154

Advertisers' Index, Page 162



Growth in the Manufacture of Heating Products



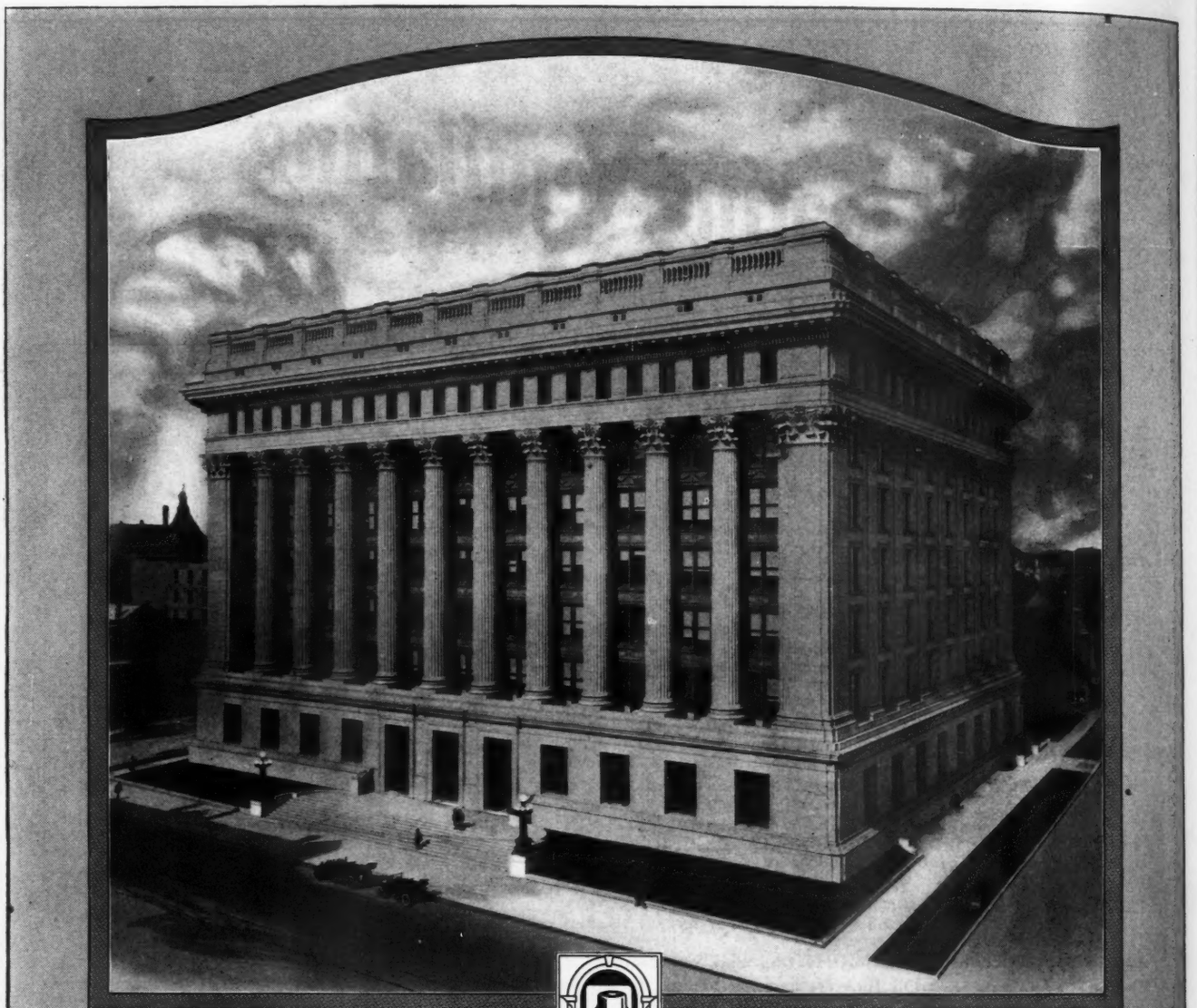
Growth in Advertising Pages of The Heating and Ventilating Magazine

YEARLY SUBSCRIPTION $2.00 **SINGLE COPIES, 20 CENTS**

Published monthly at 1123 Broadway, New York, by the Heating and Ventilating Magazine Co.

Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

Copyright, 1925, by Heating and Ventilating Magazine Co.



NORTHWESTERN MUTUAL LIFE BLDG. MILWAUKEE — JOHNSON TEMPERATURE REGULATION INSTALLED

Economy never is unbecoming. Extravagance is the thing without excuse. This applies, particularly, to fine structures today. The Johnson Pneumatic System of Temperature Regulation effects a fuel economy of at least 35 per cent per annum. Additional to that calculable certainty, The Johnson System refines the interior further by the conspicuous comfort and conveniences which it unfailingly furnishes, and by the assured correctness of each room's temperature and atmosphere which it consistently maintains. Indeed, how can a business building, or a fine home, be considered *complete* without The Johnson Pneumatic System of Temperature Regulation.

JOHNSON SERVICE COMPANY, MILWAUKEE

AUTOMATIC TEMPERATURE REGULATION FOR 38 YEARS
TWENTY-EIGHT BRANCHES UNITED STATES AND CANADA

JOHNSON